the OIL AND GAS JOURNAL

~~Ten~~ Times Through The Earth!

NOW TWENTY

The footage drilled by Hughes bits since 1909 exceeds 850,000,000 feet — or more than 20 times through the earth. This represents the industry's greatest rock bit drilling experience.

More footage has been drilled with Hughes rock bits in more formations, under more varied conditions, than with all other rock bits combined.

This rock bit performance experience, coupled with continuous research and the close co-operation of the drilling industry, enables Hughes to design and perfect bits that drill hole faster and more hole per bit!

That's why Hughes rock bits are recognized as the standard of the industry throughout the world. *This is a reprint of an advertisement run in 1951 with footage figures corrected to bring them up to date.*

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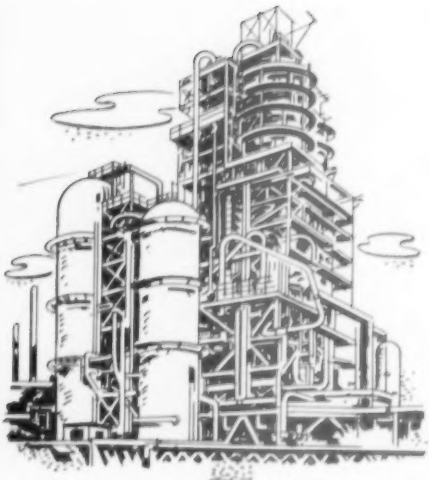
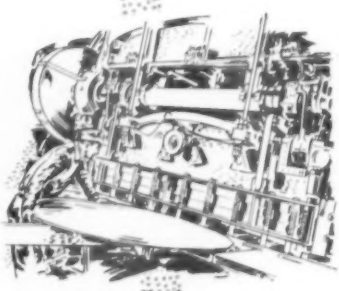
THE Wyatt STANDARD





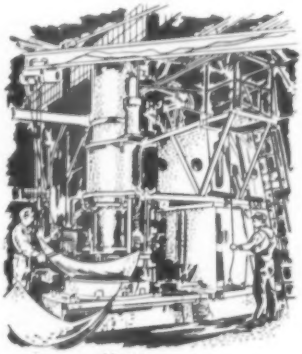
If you buy under the code of strict compliance to every specification, you will find WYATT METAL & BOILER WORKS fully willing and able to fulfill every requirement.

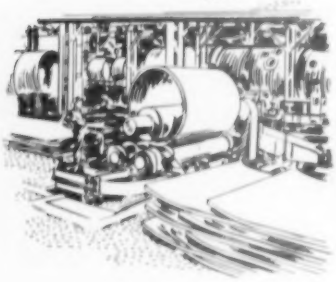
If you buy under the code of implicit faith in the manufacturer, you will find WYATT METAL & BOILER WORKS fully capable of shouldering all responsibilities for finished work.

If you buy under the code of dealing only with established companies of high standing, you will find the capacity of WYATT'S plants more than sufficient and the capital structure of the company more than adequate.

If you buy under the code of friendliness and an appreciation of mutual problems, you will find the development of WYATT METAL & BOILER WORKS parallel to that of the industries it serves.

If you buy under the code of the Golden Rule, you will find WYATT METAL & BOILER WORKS as firm a believer in that Rule today as it was when this organization was founded in February, 1913, in a little metal shop on Coombs Street in Dallas.





Wyatt's

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MANUFACTURERS AND ERECTORS SINCE 1913

the OIL AND GAS JOURNAL

JULY 5, 1954 VOL. 53 NO. 9

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1. NEW PAY . . . Seven fields are now producing from Cambrian rocks in West Central Texas. This zone was discovered in June 1953 at White Flat field, Nolan County. Wells have cored up to 142 ft. of porous and permeable sandstones in the Wilberns dolomite and Hickory sandstones.

2. NEW LOGGING TOOL . . . The maximum producible oil index can be determined from electrical log data by means of a very simple formula which does not imply the knowledge of formation factor, porosity, or residual-oil saturation. Maximum producible oil index is the amount of oil per unit volume of reservoir formations which is displaced by mud filtration.

3. FLEXIBILITY A MUST . . . Flexibility in revamping old units in process design and in reserve equipment is a must for refinery processing. Operations are changing rapidly and changes in a unit are often indicated. A flexible operation provides for greater efficiency and economy.

4. HIGH EFFICIENCY . . . Sinclair Pipe Line Co.'s program for inspection, testing, and maintaining products pipelines provides for high efficiency in line operations. A five-point program is used: (1) each joint of pipe is swabbed before welding; (2) each 5 to 15-mile length is tested with air pressure after welding; (3) completed line is hydrostatically tested; (4) presurface cleaning consists of a series of scraper passes; (5) there is a consistent periodic in-service cleaning program.

5. NEW DETECTOR . . . A mechanical scraper detector of new design when placed upstream from a station automatically shuts the station down. Another detector downstream from the station gives a positive indication that the scraper has passed. Thus station down time is held to a minimum.

Hartzell Cooling Tower Fans Handcuff These Thugs

Corrosion, abrasion and vibration can't get the best of a fan with Hartzite plastic blades. That's why these thugs steer clear of a cooling tower or heat exchanger equipped with Hartzell fans.

Hartzite blades absorb vibration, resist abrasion and are unaffected by most industrial acids, mild alkalies and weather. Even when the surface of the blade is damaged, you're not in trouble—the interior has the same high resistance to corrosion and mechanical damage.

Nearly every Hartzell fan installed since the introduction of the Hartzite plastic blade in 1941 is still in service today. Where one Hartzell has been installed on a battery of cooling towers or heat exchangers, "Hartzell" is invariably specified as additional fans need replacement.

For more details on how Hartzell, "the" cooling tower and heat exchanger fan of the petroleum industry, can handcuff the cooling tower thugs who have been causing you trouble, write today for your free copy of Bulletin A-111.

HARTZELL *propeller fan co.*

Div. of Castle Hills Corp.

Name _____

Company _____

Street & Number _____

City & State _____

If student, check here for special information ☐

Dept. P

PIQUA, OHIO

PROPELLER-TYPE FANS • BLOWERS
ROOF VENTILATORS • UNIT HEATERS

ENGINEERING OFFICES IN PRINCIPAL CITIES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Mud pump hose tough all over; tube would outwear steel

COVER, tube, reinforcements—all have been improved by B. F. Goodrich to build a mud pump suction hose to take more rough wear than any hose you've ever used.

Smooth, tough tube—B. F. Goodrich mud pump suction hose has an oil-proof tube especially developed by B. F. Goodrich to give high abrasion resistance. It's so tough it actually outwears steel in many applications. Tube is smooth so mud flows through at high speed.

Roughneck cover—It's practically abrasion-proof. Move it from job to job, drag it into position, load it into a truck—but be sure it's B. F. Goodrich hose with its extra-tough cover for extra-hard service.

Takes your highest vacuum—B. F. Goodrich mud pump hose will take the highest vacuum pressures used in mud pump work. Heavy spring steel wire spiral-wrapped and imbedded in rubber prevents collapse, keeps rig drilling without costly repairs.

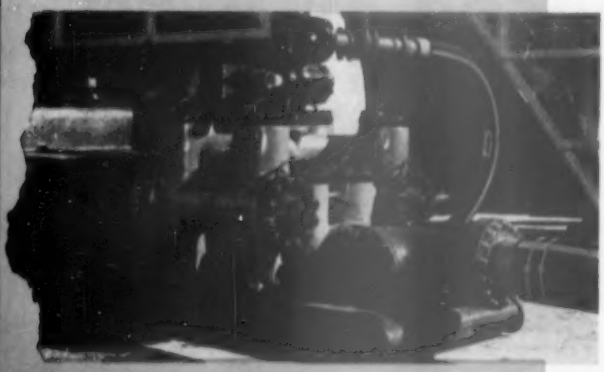
Cords cushioned in rubber—This hose is reinforced with four to six plies of cord—held together and cushioned by rubber that surrounds each individual cord. No cross threads. Hose is more flexible to help dampen vibration, yet stronger to resist crushing and kinking.

Should your local supplier be temporarily out of stock when you call, you can get B. F. Goodrich mud pump hose any time—day or night—from one of these B. F. Goodrich warehouses: Beaumont, Dallas, Fort Worth, Hobbs, Houston, Odessa, Wichita Falls, Great Bend, Oklahoma City, New Orleans, Tulsa, Williston, Denver and Los Angeles. *The B. F. Goodrich Company, Dept. M-261, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

Get Thermoid Oilfield Products at your nearest "Oilwell" Store

Powerflex Pressure Seal Rotary Hose, with patented forged steel couplings, combines light weight with great strength.



Mud-Flo Suction and Flexible Discharge Hose cuts down on rig-up time and reduces vibration in the mud lines.

THERMOID HOSE is made by patented and exclusive construction methods for each type of oilfield service . . . and is designed with extraordinary strength to withstand the high-pressure and pulsation stresses that are peculiar to drilling applications. That's why "Oilwell" stocks and recommends Thermoid products.

THERMOID POWERFLEX ROTARY HOSE . . . is a rugged combination of high-tensile steel cable, heavy-duty fabric and oil-resistant synthetic rubber; bonded together to produce a tough, abrasion-resistant hose that is unrivaled for strength and flexibility. Full-flow steel couplings are securely anchored. Each length is proof tested to 5000 lbs.

THERMOID TRIOFLEX ROTARY HOSE . . . for slim-hole drilling, is reinforced with high-tensile steel wire braid. This hose is extremely flexible and resistant to kinking and coils in 36" diameter. The tube is constructed of highest quality synthetic rubber, with a tough oil and grease-resistant cover that protects the inner sections from wear. Each length is proof tested to 2000 lbs.

THERMOID MUD-FLO SUCTION HOSE . . . is made with thick oil-resistant inner tube firmly bonded to strong cotton fabric. Heavy galvanized round wire reinforcement is embedded in rubber compound to absorb pumping vibrations and provide unobstructed flow.

THERMOID FLEXIBLE DISCHARGE HOSE . . . incorporates the same rugged construction features as Powerflex Rotary Hose and acts as a flexible high pressure connection between the mud pump and the standpipe. It eliminates many sharp-angle fittings and reduces turbulence and pressure loss.

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

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Export Office—
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USS TRADE MARK

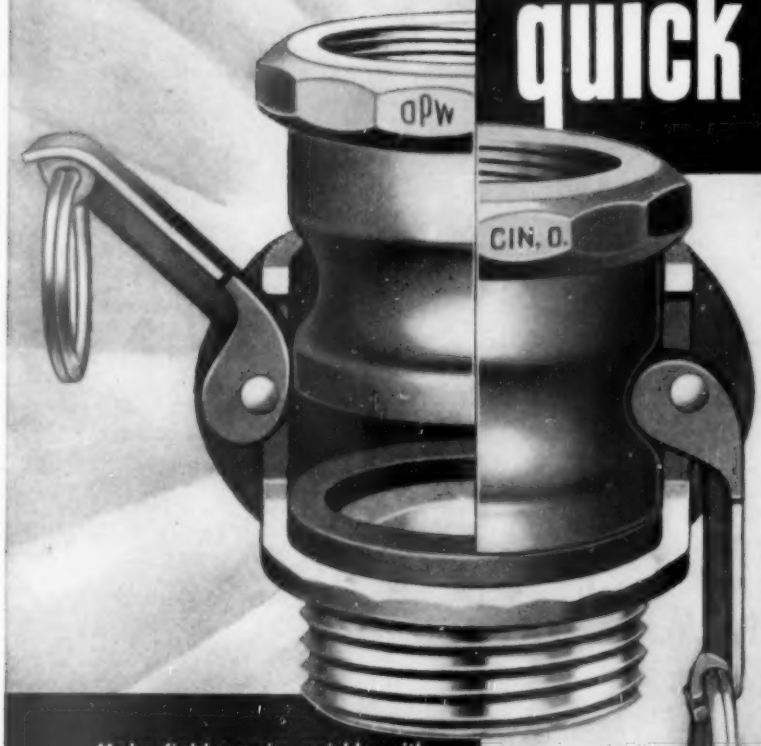
"OILWELL"

TRADE MARK

UNITED STATES STEEL

The Fastest, Surest Coupling Known

KAMLOK quick couplers

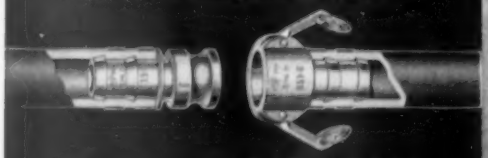


INDUSTRIAL HOSE LINES

TANK TRUCK FUEL DELIVERY MARINE SERVICE

Make field repairs quickly with this simple attachment of hose to KAMLOK shank type adaptor and coupler by using hose clamps. Leak-proof, light weight, easy to handle.

ALL KAMLOKS COUPLE AND UNCOUPLE INSTANTLY REGARDLESS OF HOOK-UP.



KAMLOK'S POSITIVE SEAL ALL ALONG THE LINE, ASSURES GREATER SAFETY IN HANDLING ALL TYPES OF LIQUIDS.

Excellent hose has been condemned too often because of inferior couplings. To eliminate twisting, kinking, and straining, to add extra life and endurance to your hose use a good coupler . . . use KAMLOKS. Available in any combination to meet coupling requirements in sizes from ¾" to 3" precision machined of special hard wear resistant bronze. 4" size of OPALUMIN.*

**OPW bi-tensile aluminum alloy.*

FREE BULLETIN F-10 HIGHLIGHTS IN DETAIL KAMLOK's QUICK, TIGHT SEAL.

OPW CORPORATION
2731 COLERAIN AVENUE
CINCINNATI 25, OHIO

OPW CORPORATION — FOR HANDLING HAZARDOUS LIQUIDS — OPW — VALVES · FITTINGS · ACCESSORIES — CINCINNATI 25, OHIO

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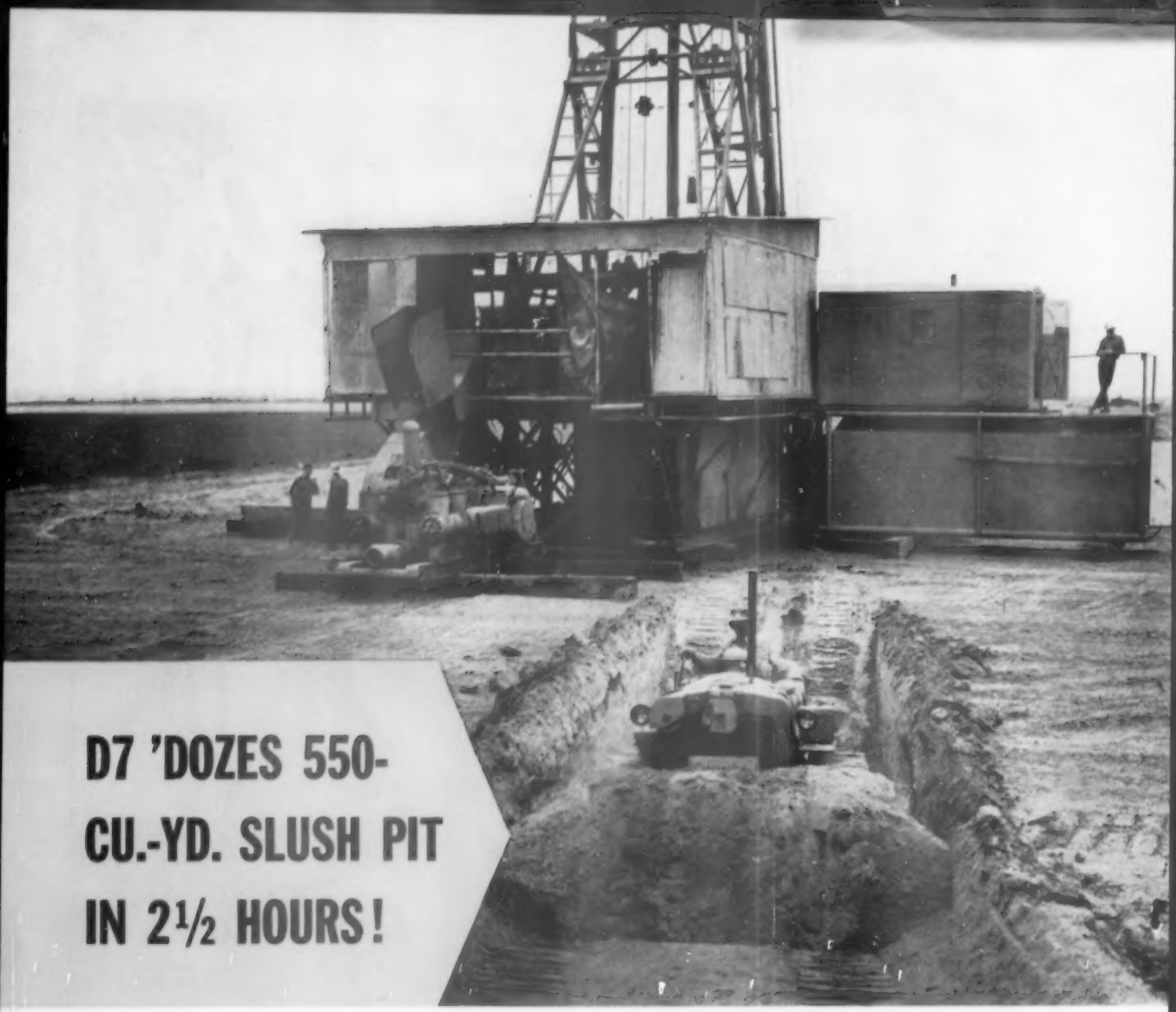


D7 'DOZES 550-CU.-YD. SLUSH PIT IN 2½ HOURS!

Just 2½ short hours after this picture was snapped, a 50′ x 50′ x 6′ slush pit was ready for action. The tough Cat* D7 Tractor that did the work, moved on to another job.

"It's always ready to go," comments owner Donald Andersen of Andersen Construction Co., Sterling, Colo. "We use our D7 for pit work and skidding rigs. We know where we stand with it."

Mr. Andersen has been using this tractor equipped with a No. 7S Bulldozer in the growing Denver-Julesburg Basin field, 20 miles northwest of Sterling.

This unit fights rising costs with the same tenacity that it attacks its work. From site preparation to cleaning up, you never run out of jobs for this big yellow work horse. It clears brush, levels drill sites, builds roads, digs and finally fills pits, moves rigs, digs gathering line trench, dikes storage tank areas and levels finished well sites.

Caterpillar equipment—all of it!—was built for hard-and-heavy use in rough country. Protected final drives and track rollers keep dust, mud and water out, lubricant in. And its sure-footed traction uses maximum engine power to do many jobs quickly and inexpensively.

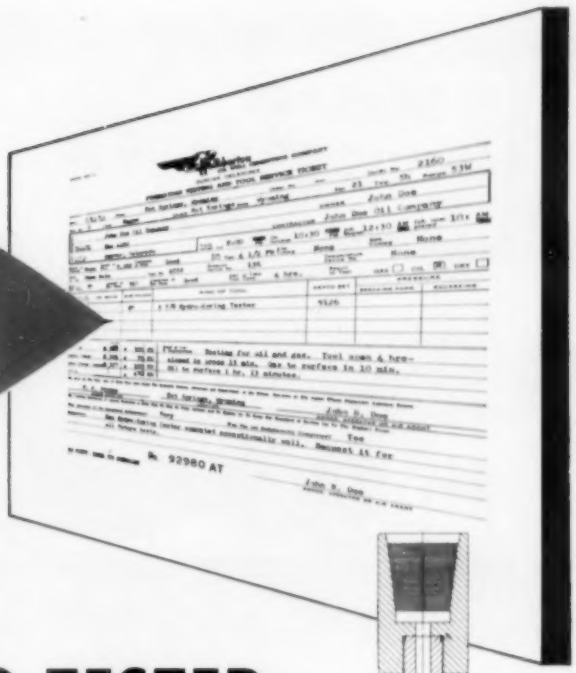
Your Caterpillar Dealer can . . . and will . . . demonstrate his profit-building equipment on your job. Call him today!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks — ®

SETS 2-YEAR RECORD
for perfect runs...



HALLIBURTON'S
HYDRO-SPRING TESTER

You can count on your fingers the mechanical failures in 20,000 Hydro-Spring tests. This near perfect, two-year record is the big miracle in modern testing, a record that's never been equalled.

Hydro-Spring makes your job easier, helps you do it better. When you order a test you expect a smooth, successful performance. But no testing tool is 100% perfect over a period of time. Nearest to perfection is Halliburton's Hydro-Spring, and the reason is that it was designed to be practically fool-proof.

For one thing Hydro-Spring opens by weight of drill pipe... 20,000 pounds opens tester in two minutes. That's all there is to it; no rotating pipe, dropping bar, or turning J-slots. You know positively that tool is open when weight indicator jumps.

Because of an equalizing By-Pass, Hydro-Spring runs in faster... reaches bottom easier. This feature reduces spudding, manipulation, damage to formation. It also prevents forcing of mud into formation being tested.

An Expanding-Shoe Packer minimizes drag going in hole, releases its grip easier, comes out of hole intact leaving less rubber to be drilled out. And when the string is back on the walk the Bourdon Tube provides you with the most accurate and detailed pressure recording available.

It's small wonder that Halliburton's first in formation testing, most popular with most operators. Let Hydro-Spring make your job easier, better. Next time call your local or district Halliburton office, just minutes away. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

TESTING
HALLIBURTON
SERVICE

Hydro-Spring Tester—Patent Applied For

HALLIBURTON'S BEST FOR YOUR DRILL STEM TEST

Wagner 15 hp splash-proof motor on a Magnolia Petroleum Company unit pumper in Lea County, New Mexico.

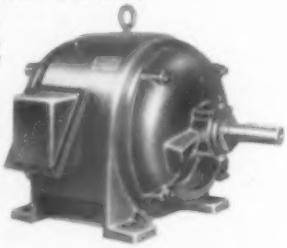
This Wagner 15 hp Type XP high torque splash-proof motor operates a unit pumper in Magnolia's Mankins No. 1 field, Shamrock, Texas.

Wagner MOTORS
your best choice
FOR OIL WELL PUMPING

Wagner Motors for oil well pumping are the standard choice of many leaders in the petroleum industry because these motors are especially engineered to do the job expected of them. They will operate continually—without attention—while exposed to all kinds of weather.

The line includes 40° C drip-proof motors that combine the desirable characteristics of open motors with protection that assures long outdoor life; splash-proof motors that offer additional protection if desired; and high power factor type capacitor motors, with the same enclosures, for use where single-phase motors are needed.

Wagner also furnishes totally-enclosed fan-cooled motors in standard or explosion proof types for use in pumping stations or refineries.



Bulletin MU-137 on Oil Well Pumping Motors and Bulletin MU-132 on Cast Iron Frame Motors give complete information. Thirty-two branch offices are ready to assist you in any motor application problem.

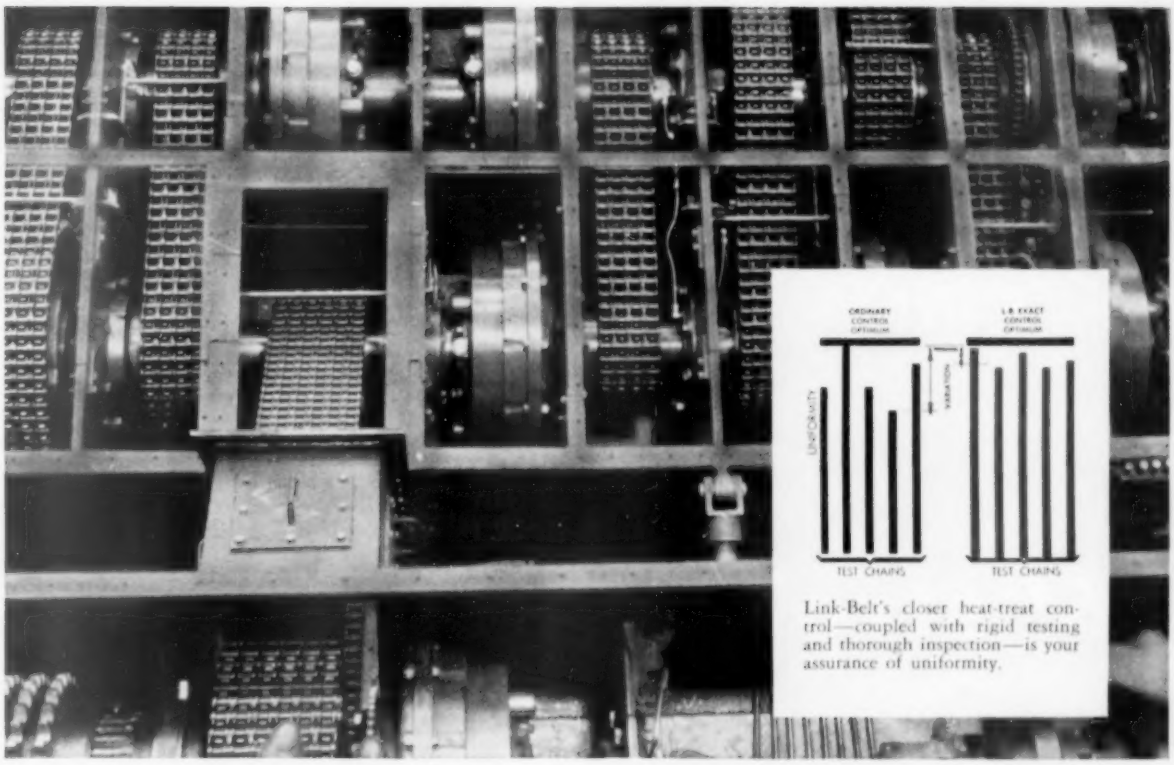
Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6389 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

MS6-19



Link-Belt's closer heat-treat control—coupled with rigid testing and thorough inspection—is your assurance of uniformity.

Closer heat treat control means longer roller chain life!

Just one of the many engineering extras you get from LINK-BELT

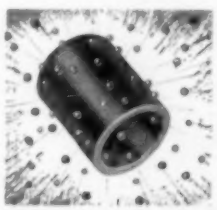
FOR drives that must operate under severe conditions, it will pay you to use Link-Belt Precision Steel Roller Chain. Closer heat treat control and many other Link-Belt engineering extras add up to *built-in* extra life. Whether it's a deep-well drilling rig or any other power transmission job, you are assured of a positive, flexible, economical chain . . . with high sustained efficiency. For complete information, call your nearest Link-Belt office or any leading supply store in your field.

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 1, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 13,559

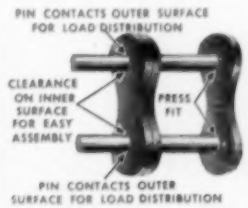
LINK-BELT

ROLLER CHAINS & SPROCKETS

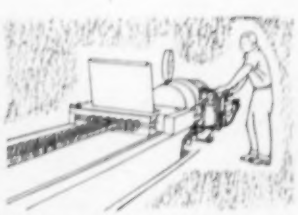
Don't overlook these other LINK-BELT extras



Shot-peened rollers have extra fatigue life under impact.


PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION
CLEARANCE ON INNER SURFACE FOR EASY ASSEMBLY
PRESS FIT
PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION

Couple and uncouple multiple-width chains more easily.



The pre-stressing of multiple width chain assures uniform load distribution.

NEW

Axelson 6′ stroke hydraulic pumping unit

The Axelson Model H-100 answers the need for a pumping unit that has low initial cost coupled with trouble-free operation. An almost constant oil flow is possible because the unit combines a fast downstroke with a slow upstroke, thus increasing the volumetric efficiency of the sub-surface pump. Axelson's hydraulic reversal valve (patent applied for) assures a gentle reversal action which is easy on sucker rods.

CHECK THESE FEATURES:

TRIPOD BASE allows spacing of the sub-surface pump by insertion of sub-couplings between the well and unit polished rod. One leg of the base is used for porting high pressure fluid, while a second leg carries discharge fluid from cylinder base back to the fluid reservoir. A very important feature of this mounting assures no contamination of the hydraulic fluid. A flange at the bottom of the tripod base forms the upper mating surface of a special Axelson casing head adapter. Adapters are available to fit any standard well head casing flange.

CYLINDER BASE may be called the "hub" of the unit. The unit tripod attaches to the bottom of the base, the cylinder into the top portion and the reverse valve assembly attaches to one side. Both power and exhaust fluids are ported through the cylinder base. An important feature is the ability to provide adequate pressure at lower reversal, which assures operation of the pilot valve. This is an asset particularly important on viscous wells.

REVERSE VALVE AND PILOT VALVE are both hydraulically operated and the combination is simplicity itself in design. Only three pressure lines feed into the pilot valve. One is internally constructed to one end and two to the other end. Each of the pressure sources operates on different areas.

RELIEF VALVE is placed in the discharge line of the positive displacement pump. It supplies positive protection against excessive pressure build-up caused by surface or sub-surface equipment.

CYLINDER DRAIN LINE returns all leakage back to main reservoir. A check valve is strategically used in this unit to allow a vacuum above the working piston to work for the operator.

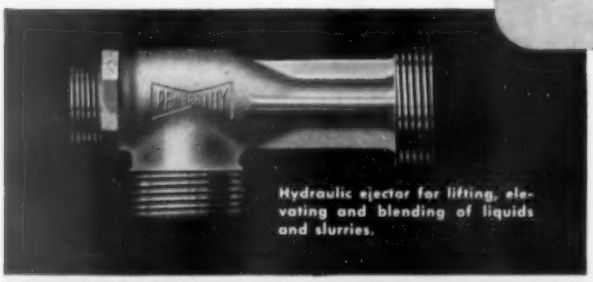
SPECIFICATIONS

Polished Rod Load (Max)	13,000 lbs.
Stroke Length (Nominal)	6 Feet
Strokes Per Minute (Max)	4.6
Upstroke Polished Rod Speed (Max)	36 FPM
Pump	40 GPM
System Fluid (Approx.)	85 Gals.
Cylinder Diameter	5 Inches
Operating Pressure (Max)	700 PSI
Input Horsepower (Max)	20 HP

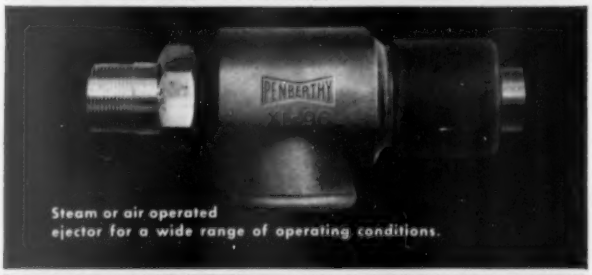
AXELSON MANUFACTURING COMPANY DIVISION
PRESSED STEEL CAR COMPANY, INC.
LOS ANGELES 58, NEW YORK 7, ST. LOUIS 16, TULSA 1

LOW COST...
COMPACT...
TROUBLE-FREE...

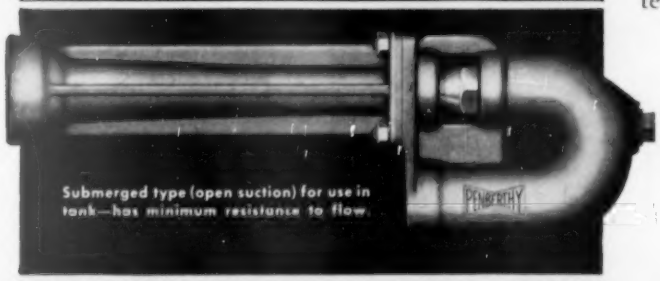
PENBERTHY
JET PUMPS



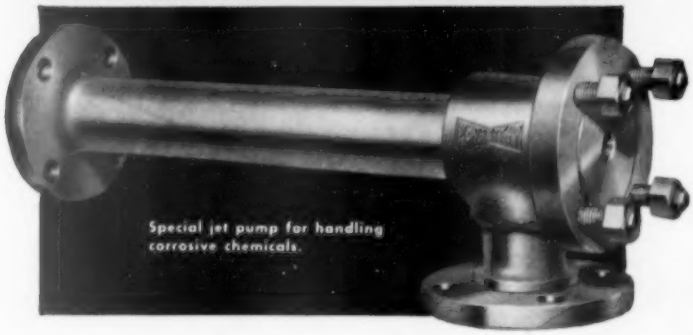
Hydraulic ejector for lifting, elevating and blending of liquids and slurries.



Steam or air operated ejector for a wide range of operating conditions.



Submerged type (open suction) for use in tank—has minimum resistance to flow.


Special jet pump for handling corrosive chemicals.

Consider the simplicity of the jet pump. It uses steam, water, air or gas under pressure to transfer or mix, without clogging, *any liquid which will flow through pipes.* It has no moving parts or packing glands. Needs no lubrication or maintenance. It's practically noiseless, costs little and is compact.

Penberthy makes a full range of jet pumps. They are being used in standard and unusual applications. Where necessary, they are made to withstand corrosion, contamination and high temperatures.

Penberthy, from wide experience, can help you save time and money, increase the efficiency of your operation. Take the first step by writing for Bulletin No. 512 which details the complete line of jet pumps by Penberthy.

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Established 1866

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Division of the Buffalo-Eclipse Corporation

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- CYCLING JET PUMPS
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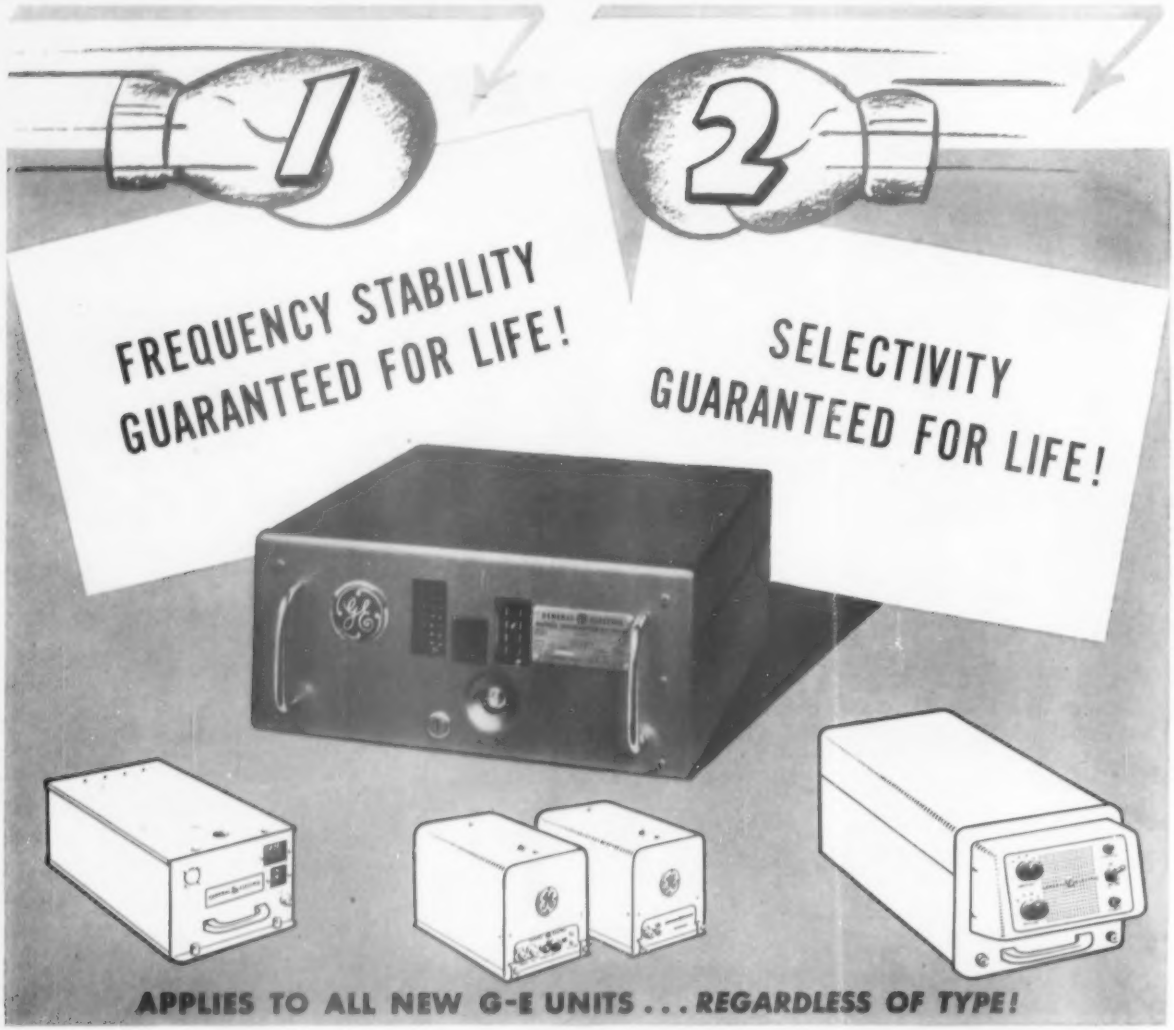
GIVE YOUR 2-WAY RADIO SYSTEM


1
2
FREQUENCY STABILITY GUARANTEED FOR LIFE!
SELECTIVITY GUARANTEED FOR LIFE!
APPLIES TO ALL NEW G-E UNITS . . . REGARDLESS OF TYPE!

2-WAY MOBILE RADIO

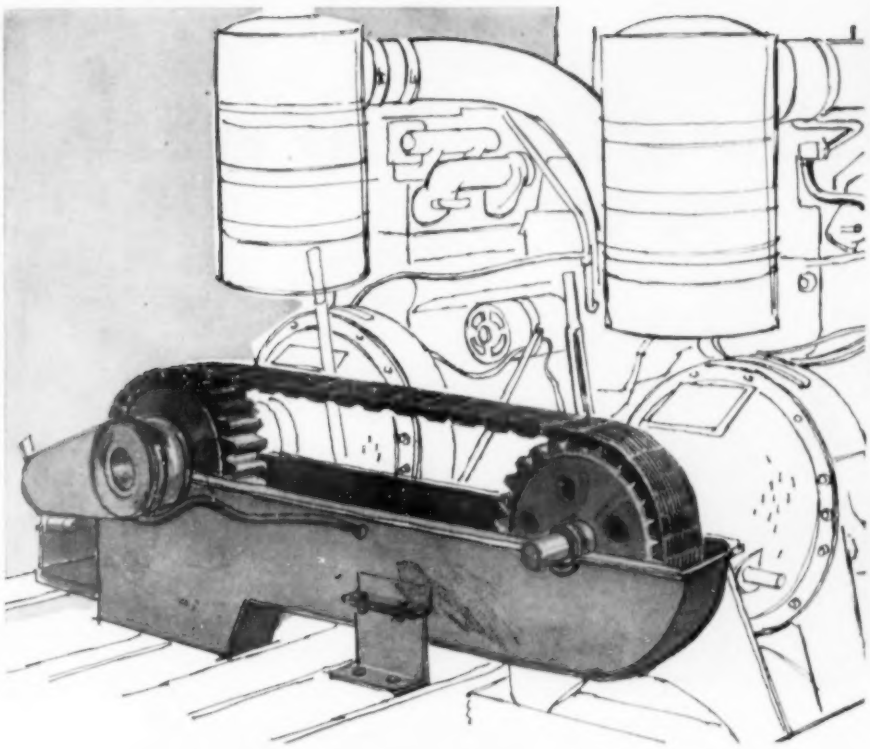
HERE . . . and *only from General Electric* . . . you have today's most potent influence on mobile radio design. G.E. guarantees protection from two major causes of unpredictable 2-way radio performance!

Guaranteed Selectivity with new multi-coil IF transformers guards your system against interference 24 hours a day! *Guaranteed Frequency Stability* clearly interprets the superior value of G-E crystals. Both, go the lifetime limit!

Printed space just can't tell the whole story. You'll want it firsthand, so pick up the phone now . . . call the G-E Communications Counselor at a local sales office. Or, write to: *Section X874-5, General Electric Co., Electronics Park, Syracuse, N.Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC



Hy-Vo's many design and manufacturing refinements result in a drive with unusual power transmitting capacity. Note involute tooth design of Hy-Vo Sprockets . . .

. . . and the new, Hy-Vo Compensating Rolling Joint, which always shifts the pitch line automatically as the Hy-Vo Chain engages the involute teeth of the sprocket.

Chain follows a path truly tangent to sprocket pitch circle, virtually eliminating chordal action. A new, balanced link design greatly improves stress distribution.

How compounding with HY-VO could save you as much as $4,560

Now, you gain new advantages in buying and compounding smaller, higher speed engines with Morse Hy-Vo Drive.

You make major cost savings.

The total cost of two high-speed engines and the Hy-Vo Drives with which they are compounded, will usually be considerably less than a single large engine of equivalent horsepower. A brief look at some figures will show how this works . . .

For example, if you needed 250 continuous horsepower at 1200 rpm., you could: 1) Buy a manufacturer's 250 hp., 1200 rpm. engine, which lists for $13,380; 2) buy the 250 hp., 1800 rpm. engine for $11,930 (using Hy-Vo as a connection and reduction drive, also eliminates the costly flexible coupling normally required in choice No. 1); 3) or, use two 130 hp., 1800 rpm. engines, listing for a total of $8,820, and use Hy-Vo as your compounding drive.

With the 250 hp., 1800 rpm. engine, you save $1,450—more than enough to pay for your Hy-Vo Drive. Compounding two 130 hp., 1800 rpm. engines, you save $4,560 over base list cost of the 250 hp., 1200 rpm. engine.

From this saving you could pay for your Hy-Vo Drive and bank several thousand dollars. In most cases, too, Hy-Vo will be so narrow it will eliminate costs of outboard bearings and mountings, with the bonus that single-engine operation is possible under reduced power requirement.

Other power transmission methods generally have either inherent restrictions on rotative speeds and velocities that limit 200 hp. or larger engines to 1200 rpm., or are too costly. Hy-Vo has far greater upper limits, with relatively lower cost.

Because of exceptional rotative speeds and velocities, Hy-Vo brings you comparable savings in electric motors, too. Write us for details on compounding with Morse Hy-Vo Drive.

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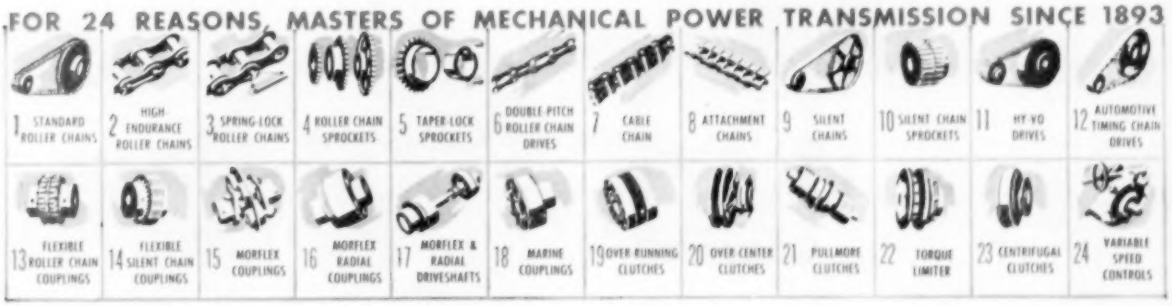

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A pin oak is a pin oak, but spring may cover one with green leaves before another shows a bud.

Welded pipe is welded pipe . . . but J&L has made things of iron and steel for a hundred progressive years.

There is logical assurance in using Buttweld and Lapweld made to J&L standards.

Our stocks are well balanced. Mill shipments are prompt.

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AIR CONTROLS mean you'll Move More with a MICHIGAN

Get right into the cab of a MICHIGAN* excavator-crane, stand behind the operator—and get an eye-full of the *right way to get more yardage.*

Notice how easy it is to operate these air control levers! Notice the sure, light touch, and the instant response of clutch rams—the swift thrust of massive power—the fast, smooth swing—the perfect "feel" of the load throughout the full operating cycle. They add up—to bigger yardage!

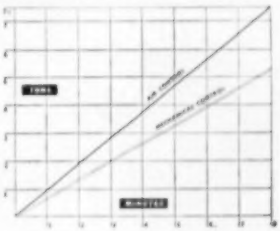
By saving seconds on every operating cycle, your air-controlled MICHIGAN can add as much as a full working hour or more to a day—and adds substantially to the amount of profit-making work done. Equally important, Air Controls are easy on the operator—don't tire him, keep his efficiency high all day.

By all means, get and read "More Yardage Through Air Power"—an attractive illustrated book that tells the full story of MICHIGAN Air Controls. A copy of it is included in the MICHIGAN "24" Fact Folio—with specifications and action photos. The coupon brings your copy—promptly.

COMPETITIVE TEST PROVES AIR CONTROLS FASTER

"Recently another company rented our MICHIGAN—and ran a test against their own mechanically operated crane. The machines were of equal capacity—the operators judged equal in skill."

"In 8 minutes the MICHIGAN loaded 7½ tons, against 5¼ tons by the other machine—a 43% victory for Air Controls." Seisman & Blumenthal, Hartford, Conn.



*A Trademark of Clark Equipment Company

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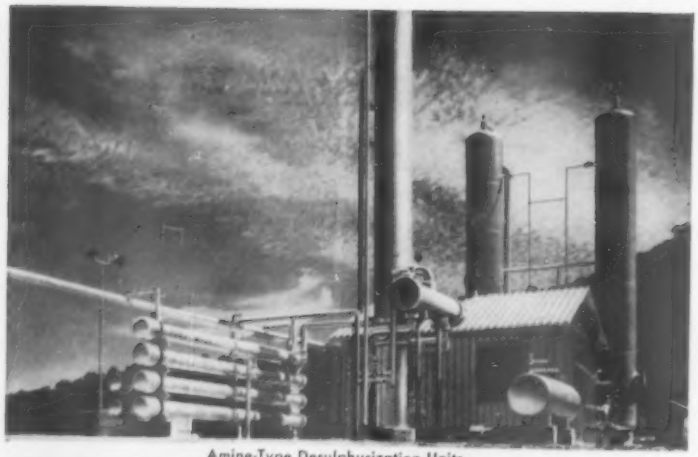

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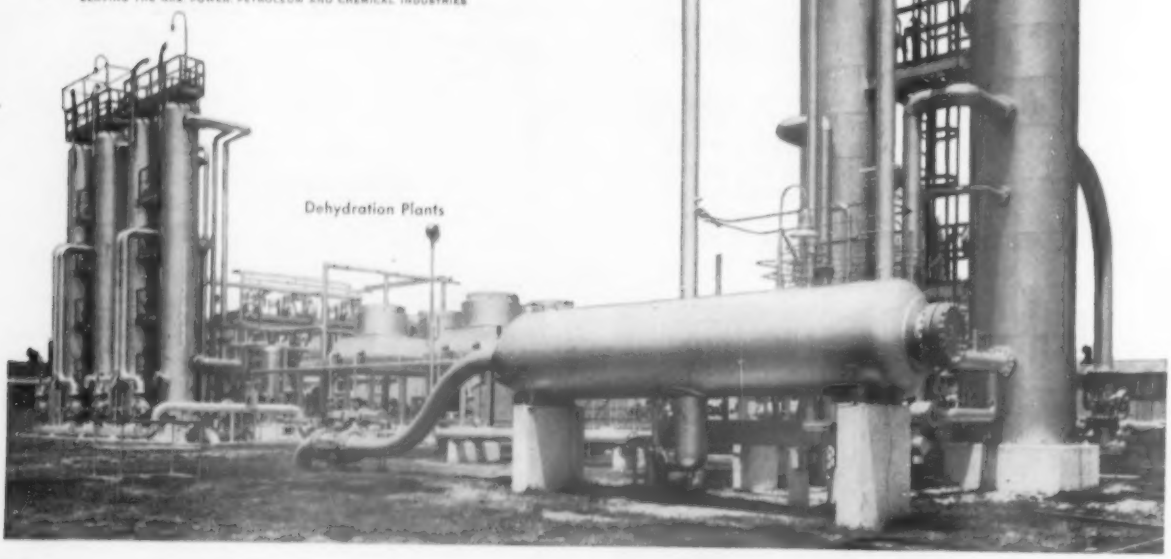

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Penetration, yes - - -

Tomorrow's Tools - Today!

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(shaped-charge perforating)

Koneshot is the shaped-charge service that delivers its deep penetration with bullseye accuracy—because KONESHOT uses Lane-Wells famous depth-measurement system, the system that's famous all through the oil country for putting the shots *exactly* where you order 'em. Why settle for less?

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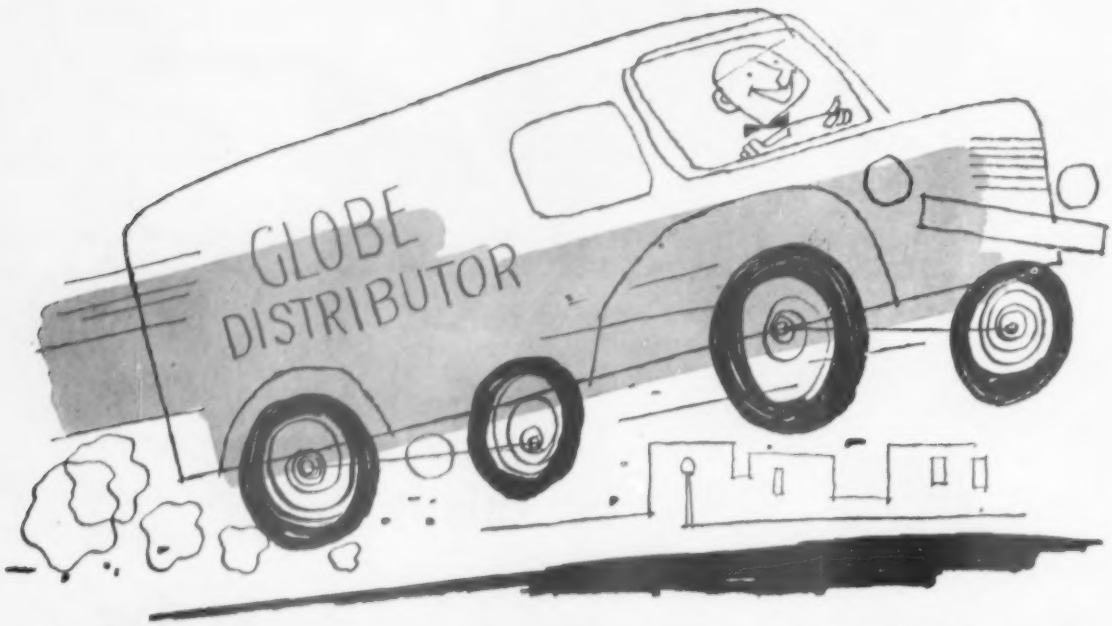

in a hurry... call your GLOBE distributor

Your Globe welding fittings distributor carries a wide variety of sizes and types in stock. As a result — he can supply you with the fittings you need . . . in a hurry.

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Only Globe — among manufacturers of seamless Welding Fittings— produces its own seamless tubes. Only Globe offers you precision-processed fittings through every step of production — from billet to tube to fitting.

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Producers of Globe seamless stainless steel tubes— Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globeiron (high purity Ingot iron) seamless tubes — Globe Welding Fittings

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

This packaged compressor plant is complete with two Beaird-Ingersoll-Rand 6SVG, 580 h.p. gas engine driven compressors, Young radiators and all necessary equipment and controls. Other sizes from 110 h.p. to 660 h.p.

Operating Profits Increased —

PACKAGED COMPRESSORS OPERATE GAS LIFT . . . CONSERVE FLARE GAS

SEABOARD OIL COMPANY designed their Plymouth compressor station to meet rapidly increasing gas lift requirements and to convert to profits 1,500,000 cubic feet of gas being flared daily.

With an eye toward future development of the field two Beaird-Ingersoll-Rand packaged compressors were installed. These units have a combined capacity of 3,140,000 Std. cu. ft. of gas per day when operating with suction at a constant pressure of 28 psig and discharging at 750 psig. Necessary controls are incorporated in the design to operate at discharge pressures ranging from 750 psig to 1000 psig. There is ample capacity for gas lifting and the delivery of excess gas into the sales line.

Designed into Beaird's flexible packaged compressor is an automatic speed control to adjust for variations in the rates of gas production. The #1 unit is operated at constant speed while the speed of the #2 unit is automatically increased or decreased to maintain a constant suction pressure.

A plus feature of the Plymouth station is its automatic operation. Built-in controls guard the plant day and night against sudden changes in operating conditions. The entire installation has required no additional personnel.

Beaird packaged compressor plants are also adaptable to gas boosting, repressuring, air compression, refrigeration, pipeline testing and other services in the field where gas is compressed.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

BEAIRD

MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

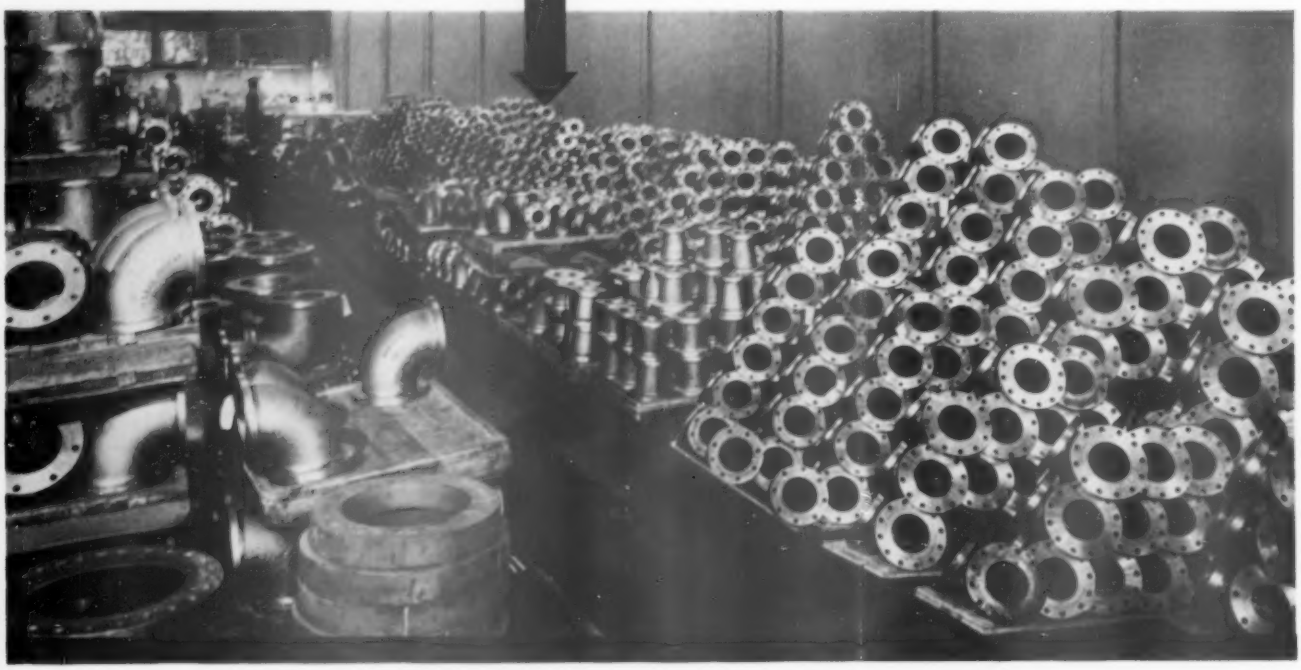
PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

BEAIRD *Cast Steel Fittings* Fittings that fit

Fittings off the shelf



That's right . . . Beaird has a complete stock of standard fittings available to meet demand!

Now, you can avoid costly delays and downtime by requesting DIRECT SHIPMENT thru your supply house or by calling us direct! Fast delivery on special fittings too . . . from our large assortment of patterns.

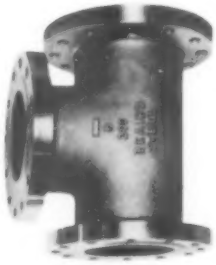
Speed up ordering by using the handy selection charts and figure numbers in Beaird's new Catalog No. 153 . . . write for your copy today!

Beaird also has complete facilities for manufacturing special items to your specifications.

Gasket Faces Machined with Fine Phonographic Finish

Why Beaird fittings are known for their true fit and high quality the world over

Flanges Fully Backfaced



Bolt Hole Circles and Flange Circumferences Concentric with Bore

THE J. B. BEAIRD COMPANY, INC.

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MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

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LP-GAS SYSTEMS

. . . you can count on the written specifications of PITT CHEM Modified Enamel!

Specifications are the tip-off on any enamel's performance . . . in good terrain or bad, in application or in service. That's why it's so important to check "specs" before you buy and to make sure that the enamel is held to close tolerances within the specifications that have been laid down.

Pitt Chem Modified Pipeline Enamel is Quality-Controlled from coal to finished product. It rigidly conforms to written specifications. These specifications have been published for your convenience and we'll welcome the opportunity to send them to you. Write or call us . . . *today!*

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Tells the importance of each specification in judging pipeline enamels . . . specific gravity, softening point, penetration, ash, etc., and gives the complete specifications of Pitt Chem Modified Enamel. Write for your free copy!

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Metallic labyrinth bushings, by reducing surface contact between bushing and valve stem, and greatly increasing bushing life, can reduce maintenance costs on the G-E mechanical-drive turbine.

ANOTHER PLUS VALUE OF G-E MECHANICAL-DRIVE TURBINES...

Metallic Labyrinth Bushings Cut Turbine Maintenance Costs

Using metallic labyrinth bushings instead of soft packing on the throttle valve stem and operating valve stem of General Electric's Type DP mechanical-drive turbine has several important advantages. Corrosive attacks on the valve stems, often caused by soft packings, are prevented.

Because surface contact between bushing and valve stem is reduced to a minimum, friction is practically eliminated—bushing life is increased tremendously. This feature alone can save you up to $50.00 in direct maintenance costs—plus the expense of down-time caused by frequent packing replacements.

HERE'S ANOTHER ADVANTAGE. Since frictional drag on the governing system is reduced to a minimum, you get more accurate, sensitive, reliable governing with G.E.'s Type DP turbine.

Metallic labyrinth bushings make an effective steam seal by means of grooves in the bushing which throttle pressure and minimize any steam leakage (see illustration).

THESE METALLIC LABYRINTH BUSHINGS are just one of many DP features which save you money throughout total turbine life. The chart below indicates other areas of savings.

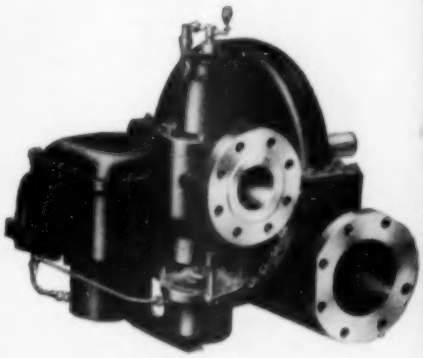
Remember—the total cost is often more than just the sales price. But G.E.'s standard DP turbines include the extra features that save you extra costs. For more information contact your nearest G-E apparatus sales office. Write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." General Electric, Schenectady 5, N.Y.

252-66

GENERAL ELECTRIC

INSTALLATION AND MAINTENANCE COST-SAVING FEATURES

THESE EXTRA FEATURES, STANDARD ON ALL G-E TYPE DP TURBINES, CAN . . .	Save You up to
COMBINED TRIP-THROTTLE VALVE Eliminate extra cost of buying and installing valve ahead of the turbine.	$200.00
SINGLE RESERVOIR FOR COOLING LUBE OIL Eliminate extra cost of piping cooling water to and between bearings.	50.00
MAJORITY OF PARTS INTERCHANGEABLE One set of spare parts protects several units—less money tied up in inventory.	100.00
METALLIC-LABYRINTH VALVE STEM BUSHING Eliminate labor costs of replacing soft packings; cut down-time production losses.	50.00
SHAFT MONEL-SPRAYED AT PACKING FIT Saves frequent cost of purchasing and installing carbon rings; contributes to long shaft and packing life.	20.00
ESTIMATED TOTAL SAVINGS	$420.00



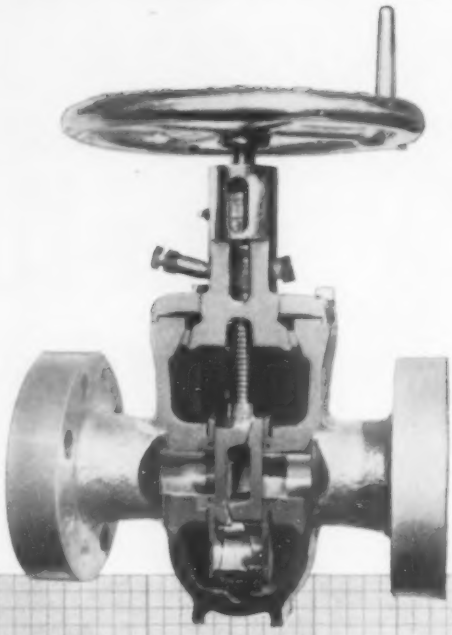
G-E Type DP Mechanical-drive Turbine

COMPARE THE FEATURES
EVALUATE ALL THE COSTS

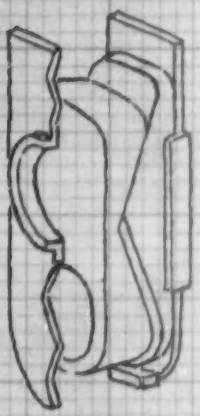
See why G-E Standard Type DP turbines are your most economical buy.

A SEAL ON BOTH SIDES

MEANS DOUBLE PROTECTION



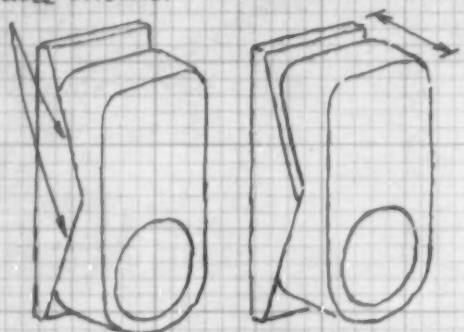
Two-piece parallel expanding gate construction gives positive up-and-down-stream seal.



Gates in closed position with rear skirt and seat cut back

The W-K-M design offers by far the most effective seal of any other design. In closed position, the split gate with its parallel faces, seats so tightly against both upstream and downstream seats that it is as positive a seal as a steel plate welded across the conduit. Yet, the gates move freely under all conditions when opening and closing the valve. The sketches at right illustrate the general construction of the gates.

All four planes in intimate contact — *Now width of gates is greater*

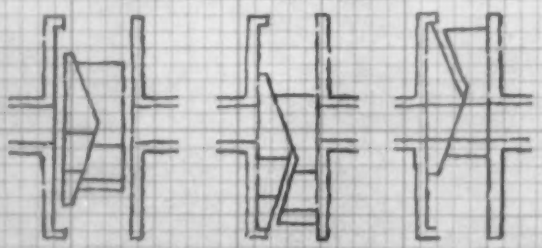


This sketch shows the general construction of the gates. The left pair is in the operating position. Both inclined planes are in intimate contact and the distance from face to face we'll call X. The right sketch shows how the gates appear in expanded position. One gate has been moved up which increases the overall width to X + △X, a width just great enough to provide the desired seating pressure.

The first cross-section sketch, right, illustrates how the gates move within the valve in operating position. The distance from gate face to gate face (X) is a few thousandths smaller than the distance between the seats, thus providing for completely free ruening while the valve is being operated.

The second sketch shows the position of the gates when the valve is closed. Here the solid portions of the gates bear against the seats at a high pressure obtained by the stem screw and the inclined planes of the gates. It can readily be seen that there is a complete seal on both sides so that direction of flow or pressure have no effect whatever on the perfect seal of the valve.

The last sketch shows the valve in open position. The same seating pressure bears against both seats, but the gate conduits are lined up with the valve conduit providing a smooth, full bore passage for the line fluid. Seating tightly on both sides prevents pressure and foreign materials from entering the body.



Why not call your nearest W-K-M Representative and ask him to show you the "tell all" small-scale working model.

W-K-M Valves

W-K-M MANUFACTURING COMPANY, INC.

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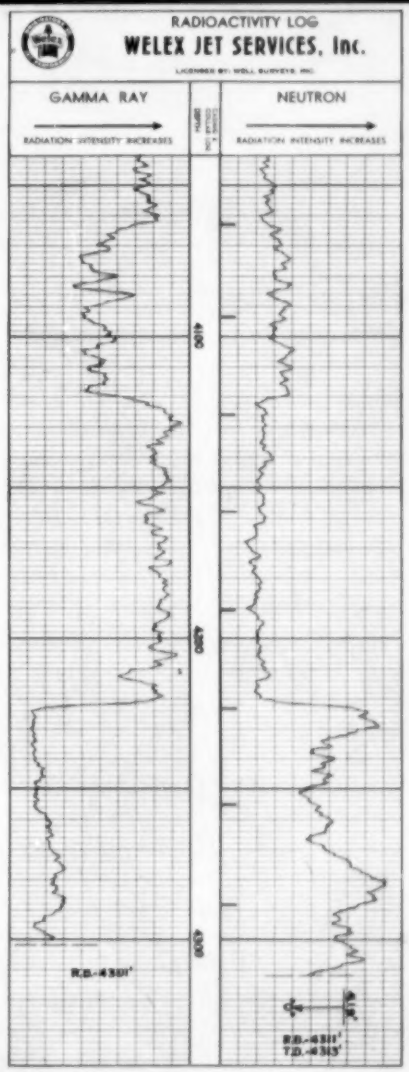
RESULTS YOU CAN RELY ON



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BY THE MOST ADVANCED RADIOACTIVITY LOGGING SYSTEM known to the industry . . . a process proved in successful application to many thousands of wells . . . Welex logs Gamma-ray and Neutron curves either singly or simultaneously to give you clear definitions of repeatable curves. The zones you want perforated are definitely located by a log of casing collars correlated to each formation.

MAXIMUM VALUE

WELEX MODERN EQUIPMENT provides the high degree of precision, sensitivity, and reliability that is essential for maximum value from your radioactivity well survey. Hoist units, depth measuring equipment, and instrument trucks are of the most modern design.

BEST EQUIPMENT

SAFEGUARD YOUR DRILLING INVESTMENT by having Welex, an experienced servicing company, log your well by a process which has been proved effective. *Results cost less* when you specify the best. . .

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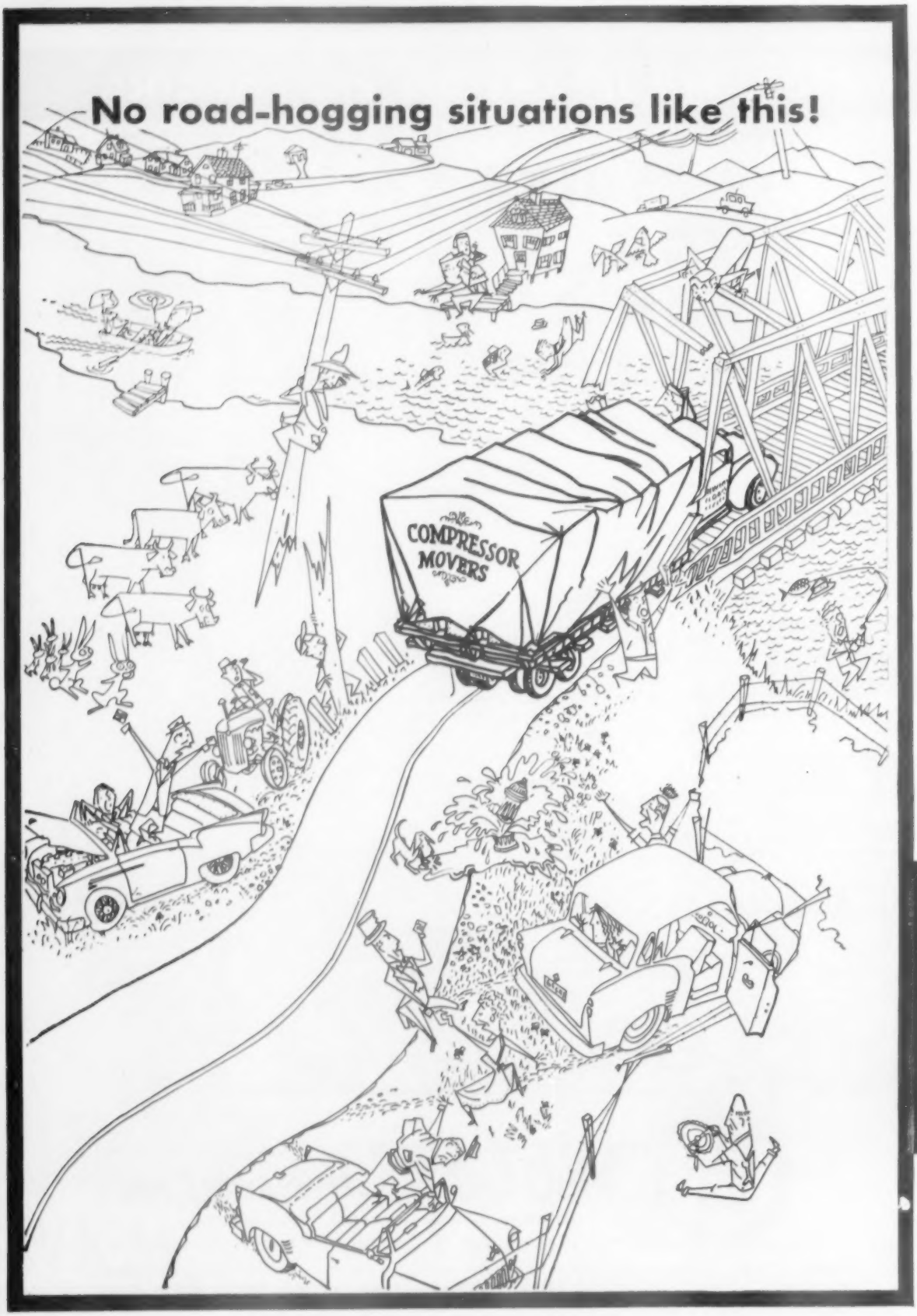

No road-hogging situations like this!
COMPRESSOR
MOVERS

Clark "Midget Angles" are

HIGHWAY WIDTH

No! Road-hogging is *not* a characteristic of Clark Midget Angle Compressors. They're *made* to be moved by truck-trailer . . . over highways, oil field roads, bridges and through underpasses . . . or by standard railroad flat car. They're *designed* from the ground up as semi-portable field compressors.

Amazingly compact and relatively light weight, most Midget Angles reach you as fully assembled, skid-mounted, factory tested, packaged compressor stations. No further engineering and field assembly are necessary. They're ready to go to work the day you receive them.

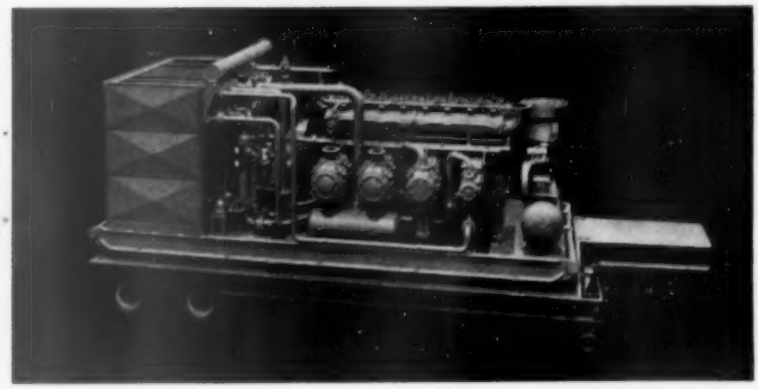
The savings in field erection labor and hauling expense, however, are only two of many Midget Angle features. If you have field gas to move, you'll want to know *all* the advantages of this outstanding Clark line which is available in 2, 4, 6, 8 and 10-cylinder models covering a range of 85-440 bhp. Request Bulletin 126 and see your nearest Clark representative for complete details.

CLARK BROS. CO. • OLEAN, N. Y.

DIVISION OF DRESSER OPERATIONS, INC.

Sales Offices in Principal Cities Throughout the World

Compact, factory packaged

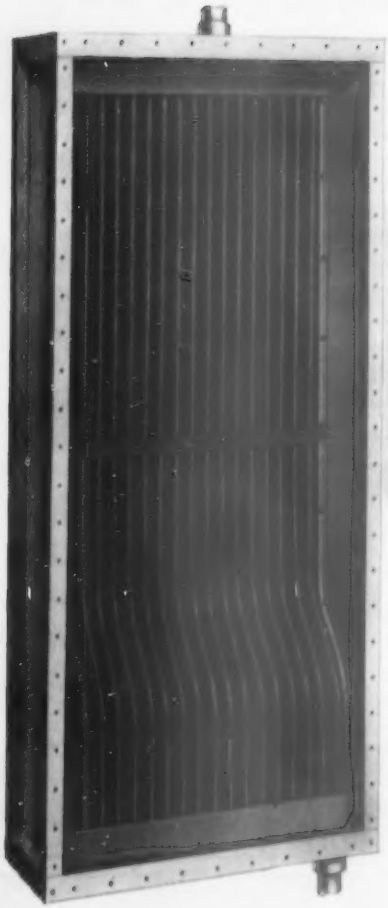


CLARK

compressors

Clark sets the pace in compressor progress

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



for

Heating
Cooling
Process
Air Conditioning

ASK THE AEROFIN MAN

Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION
101 Greenway Ave., Syracuse 1, New York

Put a Multi-job Expert in Your Refinery

Bucyrus-Erie Crane-Excavators Reduce Your Maintenance Costs

Handling materials on process units, excavating for leaks, general construction work — in fact, any lifting or digging job around your refinery can be handled by a convertible Bucyrus-Erie crane-excavator with top efficiency and economy.

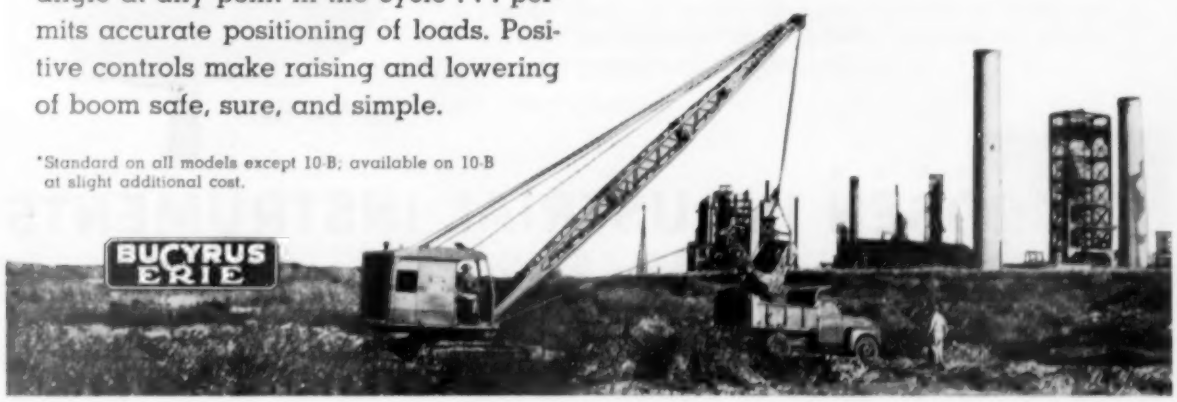
High lifting capacity per pound of weight, and ability to inch loads into place are two big reasons for the outstanding lifting crane service provided by Bucyrus-Eries. An independent boom hoist* enables operator to change boom angle at any point in the cycle . . . permits accurate positioning of loads. Positive controls make raising and lowering of boom safe, sure, and simple.

*Standard on all models except 10-B; available on 10-B at slight additional cost.

Top-flight crane performance is only one of the services you can expect from Bucyrus-Eries. Each machine is readily convertible in the field for operation as shovel, dragshovel, dragline or clamshell and produces high output at low cost with any type of front-end equipment. Let your Bucyrus-Erie distributor show how these machines can reduce maintenance costs for you. 17E54

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin



PRESSURE...
TEMPERATURE...
DIFFERENTIAL PRESSURE...
FLOW...
LIQUID LEVEL...

AMERICAN-MICROSEN *Electronic* TRANSMITTERS

the modern way to transmit measurements

Advances in process engineering demand modern electronic transmission of measurement signals, particularly when continuous, accurate and instantaneous response is essential.

American-Microsen Electronic Transmitters are ideally suited to the requirements of the modern processing plant and power station. They measure variables at the source — a vital factor wherever inflammable, hazardous, poisonous or corrosive liquids and gases are handled. Such materials are controlled best when closely confined.

All American-Microsen Electronic Transmitters incorporate the Microsen Balance, a unique electronic "nerve center" with a rectified oscillator output of 0.5 to 5 milliamperes that serves as the accurate transmission signal. Even under severe temperature or supply voltage variations, accuracy within ½ of 1% of scale is obtainable.

The simple, two-wire DC system of American-Microsen Electronic Transmitters eliminates the installation and maintenance cost of pressure piping. And, linear output makes it unnecessary to match transmitters and indicators. The design of all American-Microsen Electronic Transmitters also permits service in relaying and for use with potentiometer receivers.

American-Microsen Electronic Transmitters are ruggedly built for reliable performance under the most severe operating conditions. Get complete information. Write for Catalog 400A.

General Purpose Case

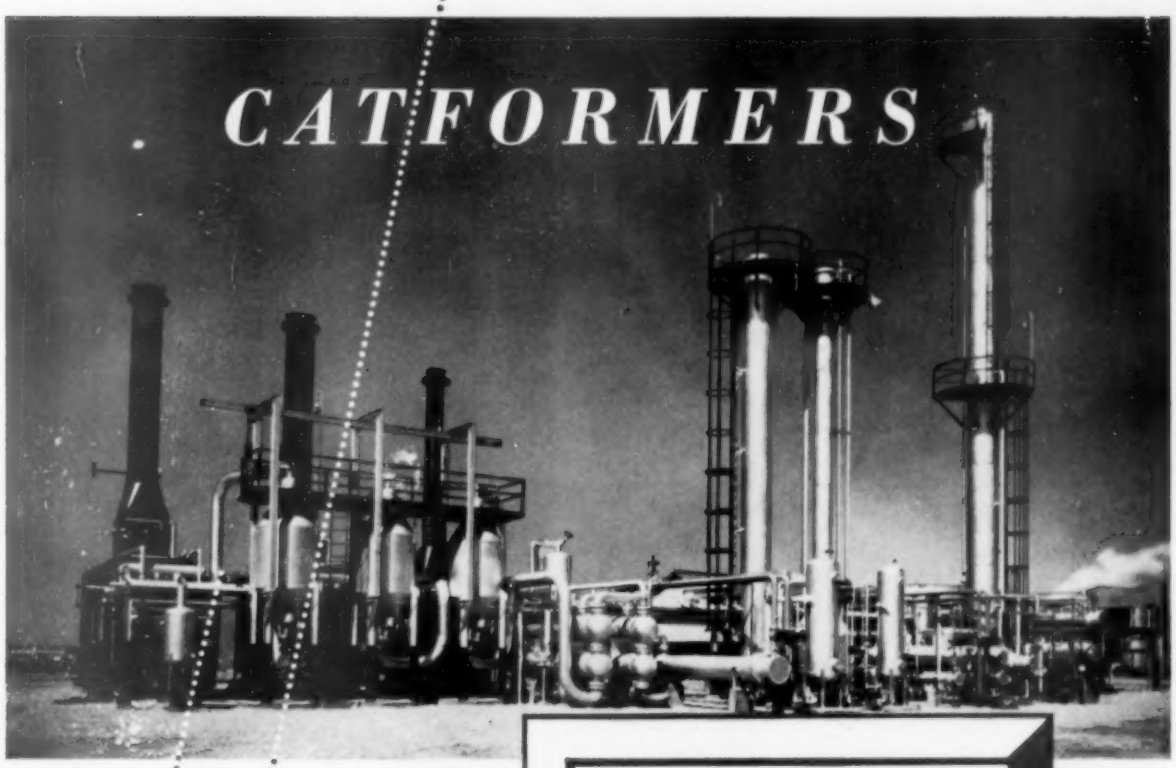
Vapor Proof Case

Explosion Proof Case

AMERICAN
MICROSEN INDUSTRIAL INSTRUMENTS

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONN.

MAKERS OF 'AMERICAN' AND 'AMERICAN-MICROSEN' INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, AIRCRAFT PRODUCTS. BUILDERS OF "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.



by **PARSONS**

Two Atlantic Type Catformers — the first on the Pacific Coast — have been designed and constructed by The Ralph M. Parsons Company.

Now on stream, these facilities were built in Bakersfield, California for DOUGLAS OIL COMPANY OF CALIFORNIA and MOHAWK PETROLEUM CORPORATION.

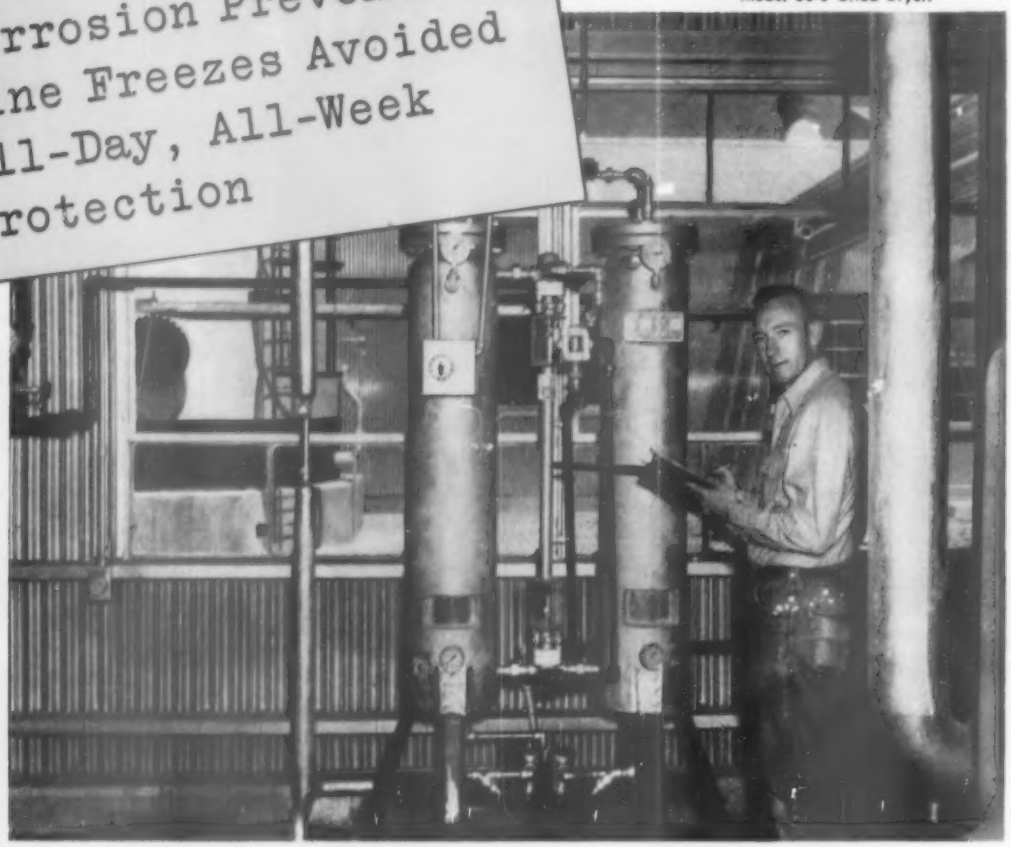
THE RALPH M. PARSONS COMPANY

Engineers • Constructors
617 South Olive Street, Los Angeles 14, California
NEW YORK • TULSA • WASHINGTON, D. C. • ANKARA • BAGHDAD • KARACHI • PARIS • BEIRUT

Case No. 108

Seaboard Oil Company Reports:

- Corrosion Prevented
- Line Freezes Avoided
- All-Day, All-Week Protection



Jerry Rea, plant worker, checks on the trouble-free operation of twin towers comprising Kemp Model 50-S Oriad Dryer.

Sulphur Producer Gets Automatic Drying of Compressed Air with Kemp

During their processing of sulphur and sweetening of natural gas, the Powell, Wyoming, plant of Seaboard Oil Company of Delaware needs large quantities of dried, compressed air to operate complex control instruments.

When their Silvertip Field plant was opened, the operators turned to Kemp to provide this dried air, installing a Model 50-S Kemp Dryer. The machine operates on a manual switching and automatic timing device. Imbedded steam coils reactivate the towers . . . permitting 25 cfm capacity at an exit pressure of 50 psi. The installation is operating 24 hours a day on a seven-day week — preventing corrosion and avoiding costly delays caused by line freezes in the plant.

If drying air or other gases is a problem in your operation, it will pay you to discuss your problems with a Kemp Engineer. He can recommend specific equipment to handle your specific problem . . . and give you the benefits of *every* Kemp installation—simplicity of operation and maintenance, low installation cost and minimum maintenance expense. A Kemp Engineer is ready to discuss your needs—without obligation.

For detailed, technical information, ask for Bulletin No. D-29. Write to:
C. M. KEMP MFG. CO., 405 E. Oliver Street, Baltimore 2, Maryland

KEMP OF BALTIMORE

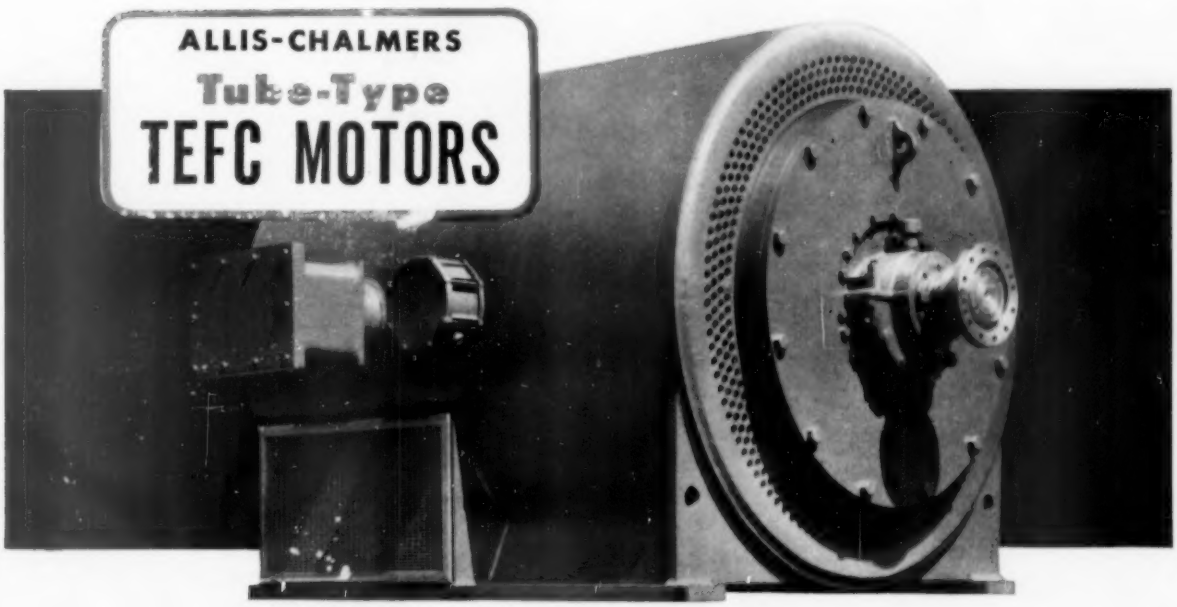
ADSORPTIVE DRYERS

ATMOSPHERE & INERT GAS GENERATORS
SINGEING EQUIPMENT • IMMERSION MELTING POTS
CARBURETORS • BURNERS • FIRE CHECKS

NOW 1250 Hp – 1780 Rpm

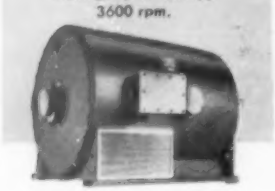
Underwriters' Approved

for Class I, Group D Service



Allis-Chalmers explosion-proof motors as large as 1250 hp, 2300 volts, 1780 rpm are now available with Underwriters' Laboratories, Inc. labels for operation in Class I, Group D hazardous locations.

Ratings up to 800 hp, 3600 rpm.



Construction used for larger ratings.

Previous to recent tests, the Allis-Chalmers Underwriter-approved motor line included ratings up to 800 hp, 3600 rpm for operation in Class I, Group D and Class II, Group F and G locations. Now, with the design used for larger ratings also Underwriters' test-proved, Allis-Chalmers can supply explosion-proof motors in other ratings required by industry.

Explosion-Proof Plus

Operation-proved by TEFC motors totaling over a quarter million horsepower, the A-C tube-type air-to-air heat exchanger design combines safety and maximum operating economy. Self-cleaning action cuts maintenance. Full internal air circulation lengthens insulation life. Complete enclosure protects stator core and other electrical parts from dirt and corrosion.

For approved motors for hazardous dust and gas locations, contact your A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4431

ALLIS-CHALMERS

why NATIONAL can meet your

PUMPING UNITS
most exacting needs...

More than 20,000 National Pumpers have been put into service to meet the most exacting needs of oil men everywhere. Here's why:

1. They are ruggedly built and precision-engineered
Jig-welded construction, reinforced at all points of extreme stress, assures ample strength. Precision engineering provides for positive alignment and interchangeability of all component parts.

2. They are easy to assemble and adjust
The simple, compact design of National Pumping Units makes possible easy field assembly. Every component section, from main base to walking beam, has adjustment features which guarantee true alignment to the well. Counterweights are designed for easy, safe adjustment by one man at ground level (see below).

3. They cost less to operate and maintain
Needle type anti-friction saddle and pitman bearings, self-aligning wrist pin bearings and pressure relief valves to prevent over-lubrication are typical of the many quality features which provide for efficient, low-cost operation. Because National Pumpers are individually engineered to perform dependably under specific load requirements, they require a minimum amount of maintenance.

4. They are exceptionally long-lived
National Pumpers have an outstanding reputation for giving long, non-stop service under all conditions. The extra stamina built into them provides for smooth operation—even when depth ratings are exceeded.

5. There is a model to economically suit every load and field condition
National's complete line of pumping units ranges from a 3,200 pound API rated walking beam unit to a 32,400 pound API rated walking beam model. A total of *38 combinations*, in beam and crank counterweighted types, are available, and you can easily select the exact unit to best handle each job.

Facts and figures on the unit that's best for your well are readily obtainable from the National Supply Representative in your area. Why not let him show you how it pays to standardize on National Pumping Units?

THE NATIONAL SUPPLY COMPANY

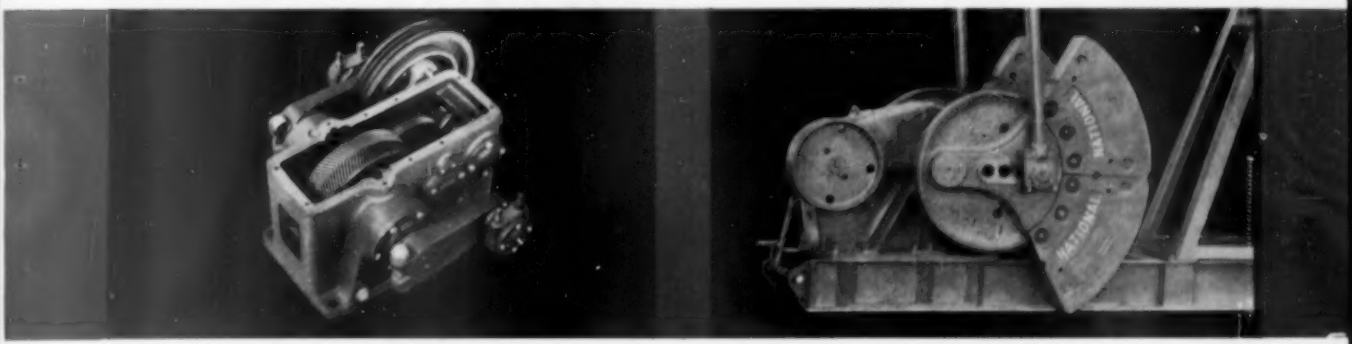
PITTSBURGH 30, PENNSYLVANIA

First in quality...
First in supply service
in oil country everywhere

Division Offices: Denver; Ft. Worth; Houston, Pittsburgh; Tulsa; Torrance
Canada: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
Export: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C. 2

NATIONAL BLUE PRODUCTS

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT **SPANG STEEL PIPE** **SUPERIOR & ATLAS ENGINES**



National gear reducers, precision-built in single and double reduction types, are run-in under load at the factory to assure quiet and efficient operation in the field. All moving parts are cascade lubricated, and all extended shafts have weather-tight oil seals. Sediment chambers in gear cases can be quickly cleaned by means of easily accessible magnetic drain plugs.

Reduced power consumption and minimum stress on the unit and rods are made possible with National's patented eccentric type disc crank. With its rim-locked counterweights, it is safely and easily adjustable by one man at ground level. The weights slide around the track to any desired position, allowing the very maximum in accuracy of counterweight effect and degree of lag and lead.

AVAILABLE JOHNSTON by AL CAPP
HELP!!
GRAMPAW JUST FELL IN THE WELL, BLESS HIS CREAKY OLD BONES!!
DON'T WORRY!!—HERE WE ARE—"AVAILABLE", AND "ACCURATE"—THE JOHNSTON BOYS—WITH OUR JOHNSTON JAR!!—
THEY KNOCKED GRAMPAW LOOSE!! NOW, THEY'RE FISHING HIM OUT WITH THAT JOHNSTON JAR!!
IT DOES BOTH JOBS!!
IT HIT WITH JUST THE RIGHT FORCE, TO LOOSEN HIM WITHOUT HURTING HIM!!—
THOSE JOHNSTON BOYS ARE AVAILABLE FOR ANY TESTING JOB—AND THEY DO IT SO ACCURATELY!
Al Capp

C-544

Copr. Capp Enterprises 1954

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

News from down on the farm

It wasn't so long ago that most tractor dealers harvested a growing crop of complaints about valve failures every season. Now complaints about valve burning are becoming as rare as buckboards.

Why?

To make a long story short: Back in 1950, an Ethyl survey of 12,000 tractor dealers disclosed that valve burning was becoming increasingly serious. And, even though this was largely a mechanical problem, petroleum refiners and marketers also were concerned because they were hearing about it from their customers.

We knew that valve rotators had successfully prevented valve burning in heavy-duty trucks—and would be equally effective in tractor engines. So, as a service to the petroleum industry, we decided to tell tractor manufacturers, dealers and farmers of our experience.

(*Continued on next page*)

ETHYL
ETHYL CORPORATION

Printed in U.S.A.

(*Continued from preceding page*)

We organized an educational program promoting valve rotators. Nearly half a million rotator booklets were distributed and Ethyl valve-rotator films toured the country. Ethyl demonstration trailers followed through with complete information on valve-train servicing, installation methods and the like. And, of course, strong advertising was placed in tractor trade publications.

Result: Today, rotators are available at the factory for more than three-quarters of the tractors produced. (Only one model could be so equipped in 1950.) And more than 95% of all tractors made since 1939 can now be equipped with rotators.

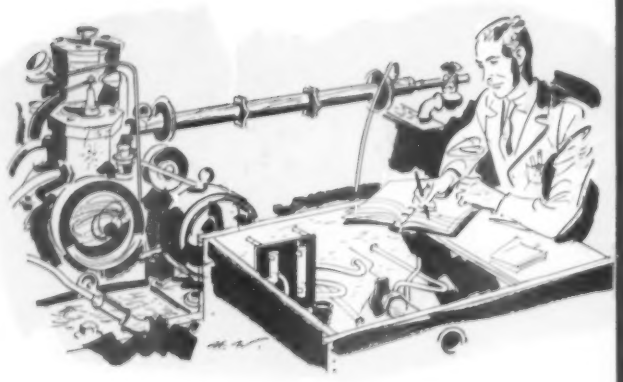
MOST IMPORTANT, VALVE BURNING IN TRACTORS IS NO LONGER A PROBLEM.

This is another example of how Ethyl's unique position in the industry enabled us to perform a valuable service and protect an important petroleum market.

ETHYL CORPORATION
NEW YORK 17, NEW YORK

WORTH NOTING

Streamlined mobile classrooms have proved a most effective Ethyl service tool in providing on-the-spot instruction in precision service of tractor engines.

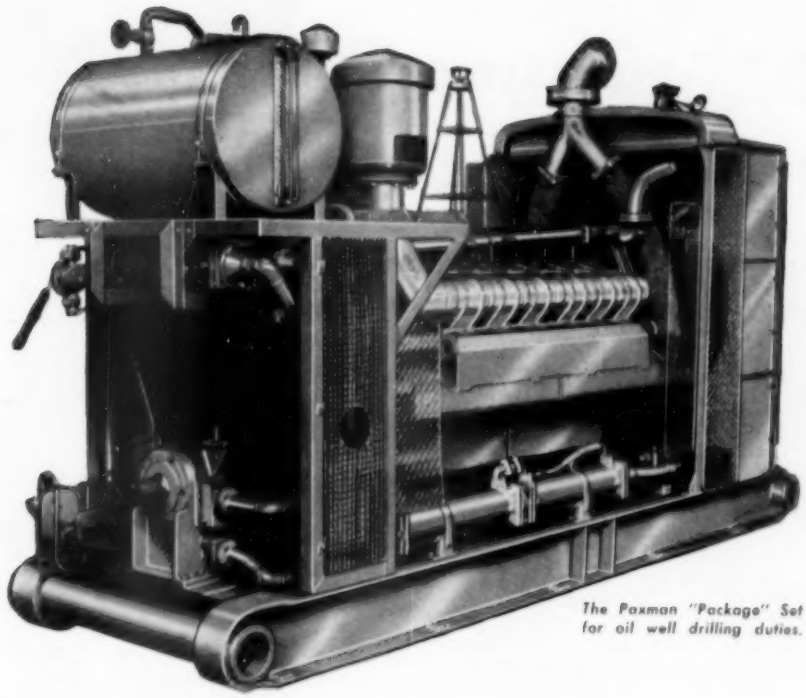


Invisible particles in engine exhaust gases are trapped in this electrostatic precipitator to help Ethyl research people develop better antiknock compounds.

Your best gasoline will be promoted to motorists beyond the reach of Ethyl's television program by minute movies in more than 350 selected drive-in theatres.

ETHYL

Ethyl Service is backed by 31 years of antiknock experience



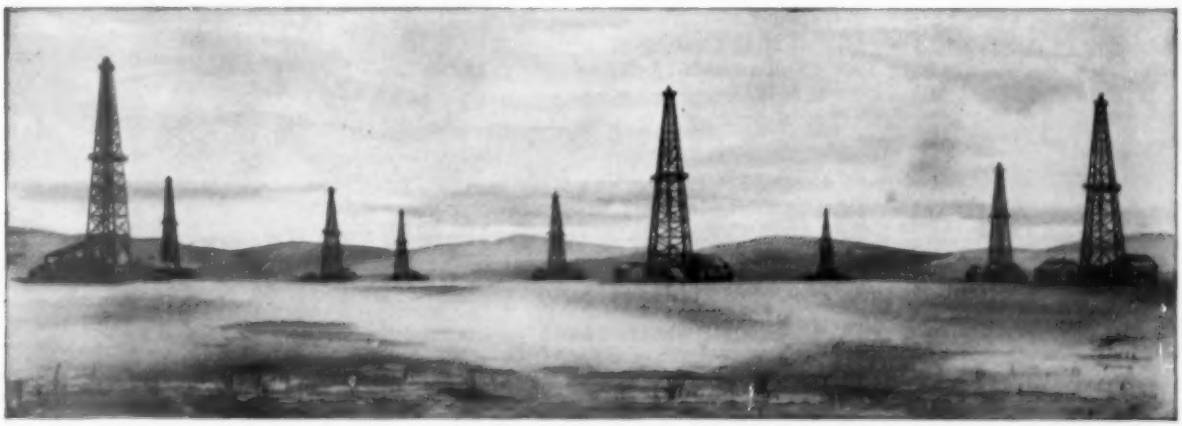
The Paxman "Package" Set for oil well drilling duties.

packed with power

Those engaged in the tough, arduous work of oil well drilling think highly of the Paxman "Package" Set. They like it for its sufferance of rough handling, its ability to keep going under any conditions and its adaptability for almost any type of drilling rig. Paxman Package Sets are available with a horsepower range of 130-665 s.h.p. at the output shaft.

PAXMAN *diesel engines for oil well drilling*

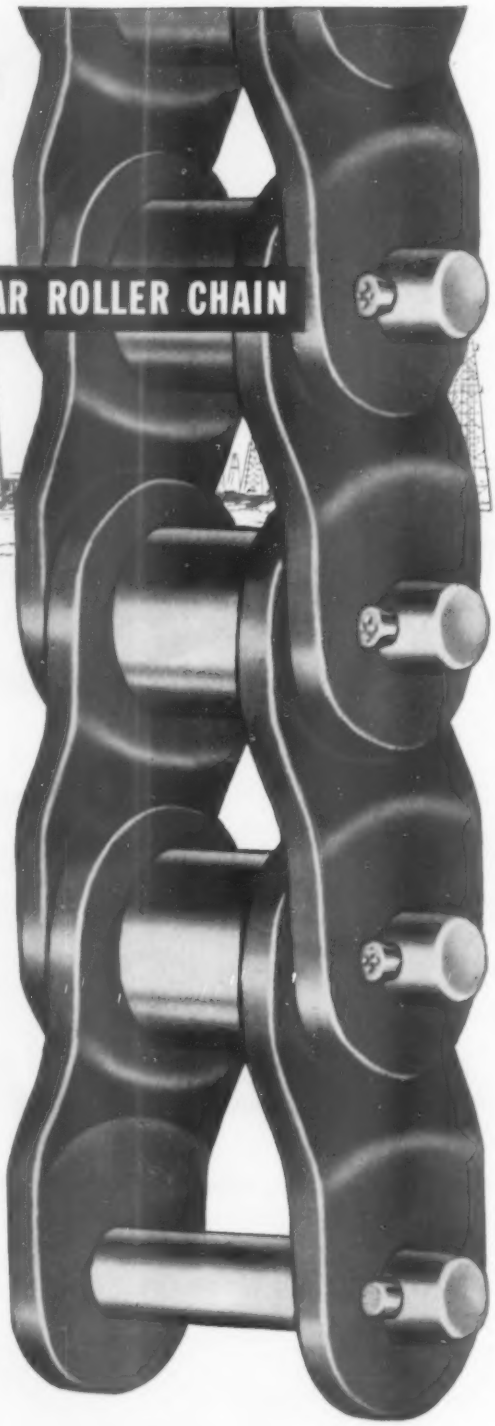
DAVEY, PAXMAN & COMPANY LIMITED COLCHESTER *(ASSOCIATED WITH RUSTON & HORNSBY LTD. LINCOLN)*



A Great OIL FIELD CHAIN

NOW BETTER THAN EVER!

PRECISION-BUILT REX OFFSET SIDE BAR ROLLER CHAIN



Rex Offset Side Bar Roller Chain, for years a favorite in the oil fields, is now better than ever. Improved materials plus the finest manufacturing techniques and heat treatment make it the ideal chain for high-speed, low-cost drilling. It is built to the same exacting tolerances and finishes as highest quality standard roller chain.

And you still get these outstanding Rex features . . .

- ★ **It's built to take it . . . built-in clearances between working parts enable chain to operate under the toughest conditions.**
- ★ **Pins are heat-treated to resist shock loads. All parts are highly finished.**
- ★ **It's easy to couple and uncouple. Links exactly alike. No special coupler links to deal with. Can be lengthened or shortened by adding or removing only 1 pitch.**
- ★ **It comes boxed in convenient 10-foot lengths.**
- ★ **Runs over same sprockets as standard A.S.A. roller chain. Available from 1¼" to 2" pitch in single and multiple strands.**

For all the details write for Oil Field Chain Bulletin No. 52-3. Chain Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT REX COMPANY ®

Chain Belt COMPANY OF MILWAUKEE

OIL FIELD SALES OFFICES

New York • Tulsa • Dallas • Houston • Midland • Los Angeles

"Sold in leading supply stores throughout the oil country."

LOOK INTO ROCKWELL "201"

ORIFICE METERS

FORGED STEEL MANOMETER ASSEMBLY.
EQUI-ANGULAR DIFFERENTIAL LINKAGE.
DIFFERENTIAL ADJUSTING SCALE.
TONGUE AND GROOVE GASKET SEAT.
STAINLESS STEEL DIFFERENTIAL MECHANISM.
POSITIVE SEATING OVERRANGE CHECK VALVE
PRECISION BORED LACQUER FINISHED MERCURY CHAMBER.
MACHINED FLAT TO CHECK MANOMETER LEVEL.
CHAMBER UNION PERMITTING INTERCHANGEABLE DIFFERENTIAL RANGES.
BALL TYPE IMMERSED UNDERRANGE CHECK VALVE.
ACCESSIBLE STANDARDIZED CAP SCREWS REQUIRING BUT ONE WRENCH.
EQUI-FLOW DAMPENING VALVE.
NEEDLE POINT DRAIN SCREW.

Better

Design and Materials
Readily Adaptable
Easy To Maintain

You are looking at a sectional rear view of the better designed Rockwell "201." Note the lavish use of highest grade materials, the ease of disassembly for servicing, the ready adaptability for interchanging high side chambers. Now, consider the money saving, money earning advantages of using Rockwell "201" orifice meters on all your lines. Full details are given in bulletin 1050. Write for your copy today.

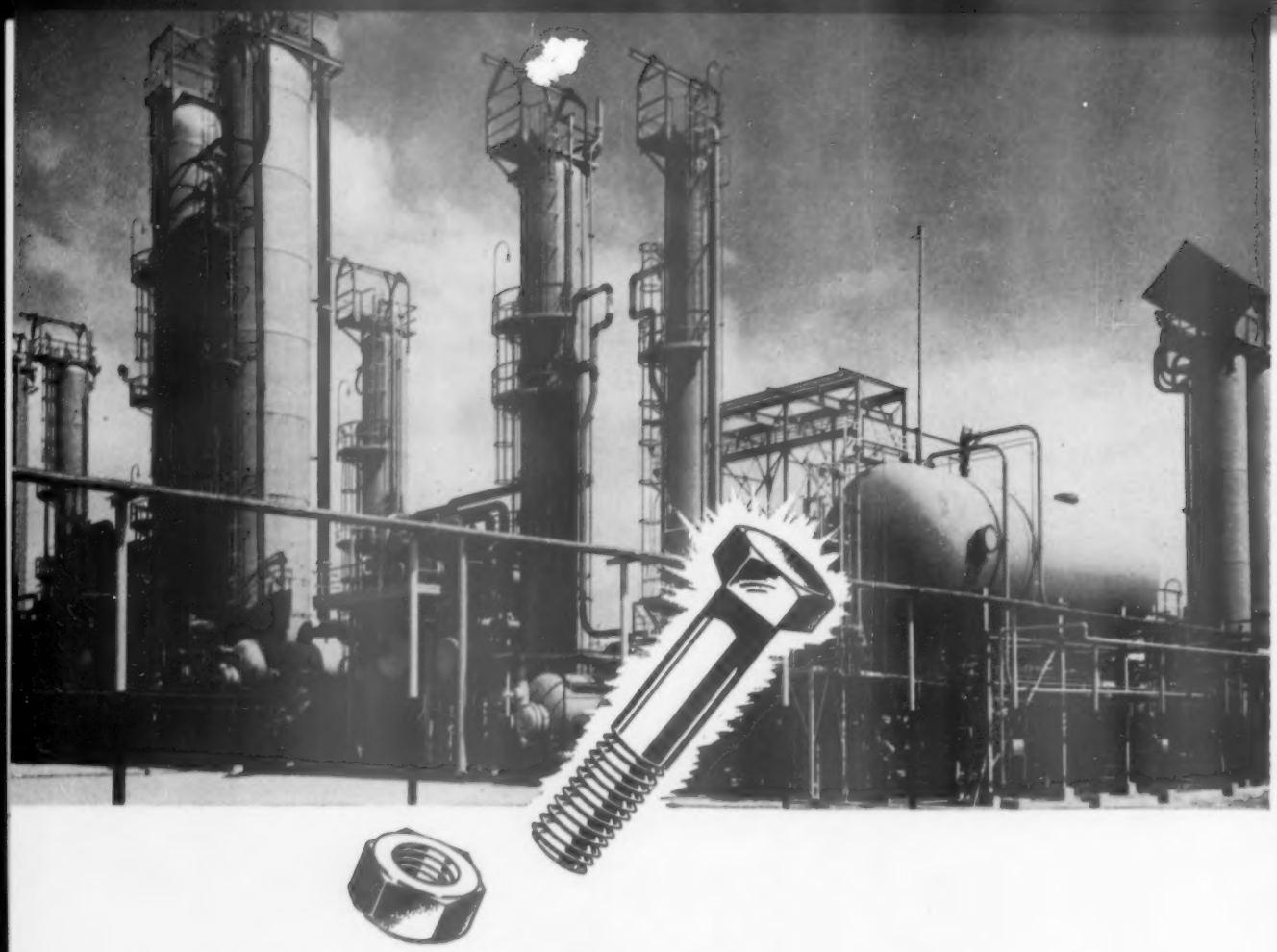
THE ROCKWELL INTEGRATOR

The office companion to all your orifice meters. Accurately computes the total extension of charts by simply tracing the static and differential records as recorded by the meters. One integrator, with operator, can handle up to 300 average charts per day. Write for Bulletin 1016.

YOU CAN RELY ON ROCKWELL

ROCKWELL MANUFACTURING COMPANY PITTSBURGH 8, PA.

Atlanta Boston Chicago Dallas Houston Kansas City, Mo. Los Angeles New York
Philadelphia Pittsburgh San Francisco Seattle Tulsa *In Canada:* Peacock Brothers Limited



Right down to the last Nut and Bolt

ARTHUR G. MCKEE & COMPANY are organized to take complete responsibility for *all details* of your project from the preliminary planning stage through complete construction—literally down to the last nut and bolt.

The advantages of this undivided responsibility are manifold. You are relieved of the necessity of hiring technical help and field crews, of negotiating with numerous sub-contractors and suppliers, of co-ordinating activities and arrival of materials, of time-keeping, supervision, inspection and countless other details.

McKee performs all these functions under a ***single contract*** and with a thoroughness and efficiency born of long, specialized experience.

Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
Offices: New York • Tulsa, Oklahoma • Union, N. J. • Washington, D. C.
British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 350 Bay St., Toronto

McKee Engineering Services

for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

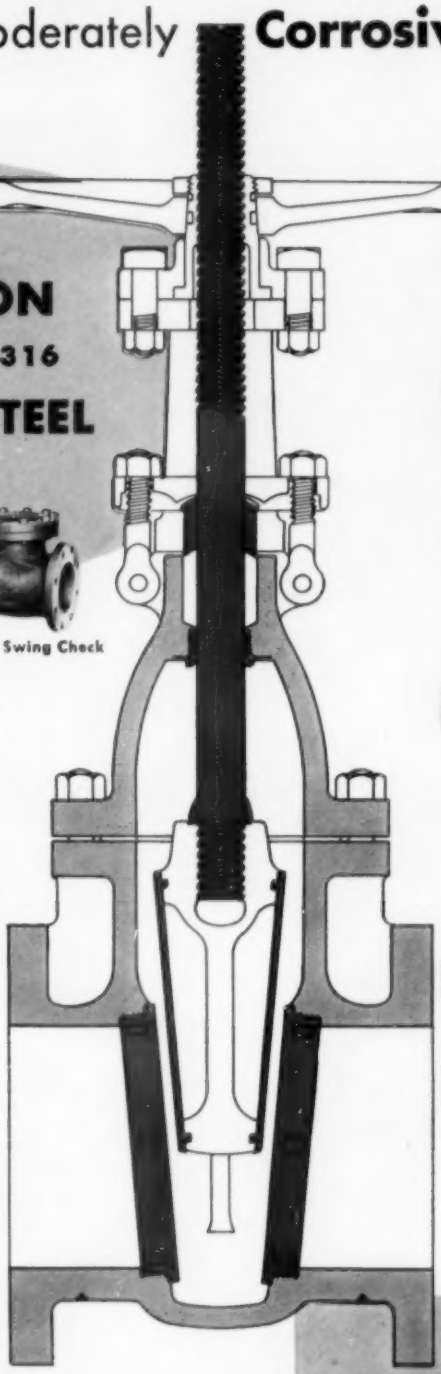
NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

Fig. 2624 Swing Check



Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2" to 4" sizes.
- **WEDGE** In 10" to 24" sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10" to 24" sizes.
- SEAT RINGS
- DISC and HANGER in Check Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2" to 8" sizes.

PRESSURE RATINGS

2" to 12"—200 lbs. O.W.G.
14" to 24"—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

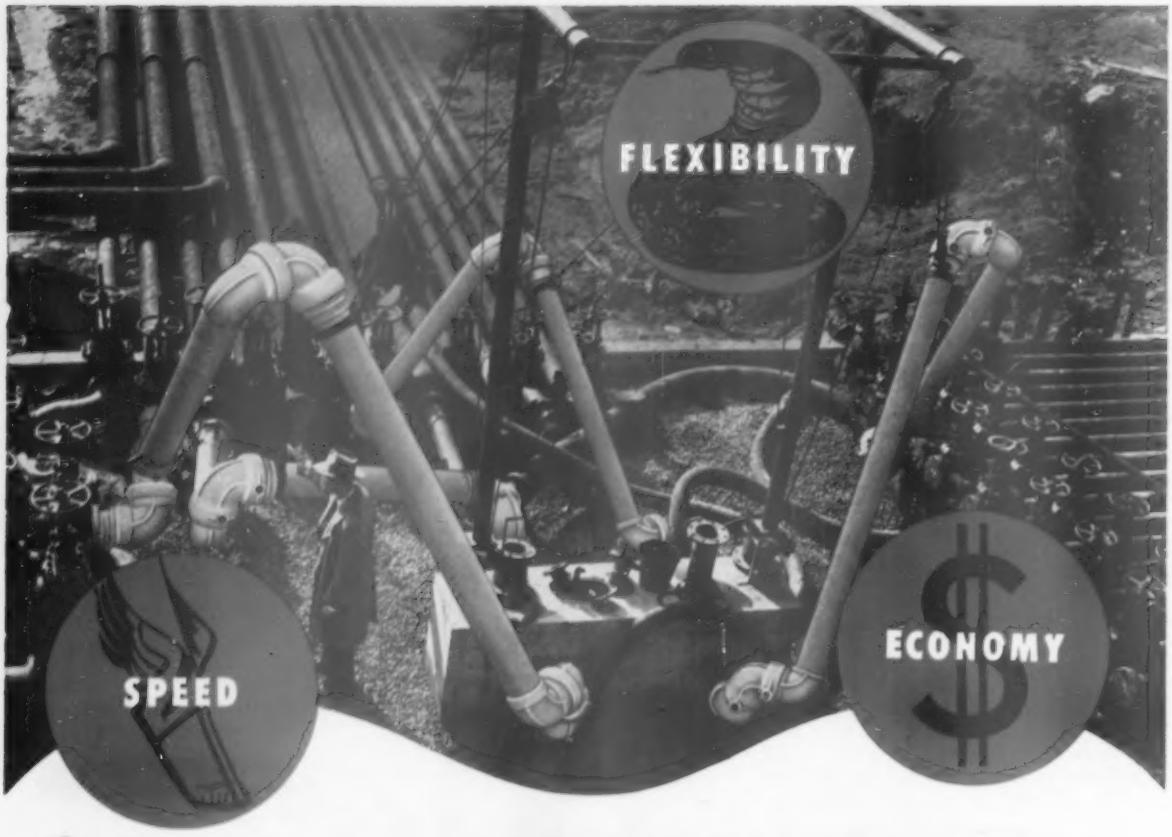
A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

ALSO RECOMMENDED for fluids used in electroplating, photograph finishing, textile bleaching, dyeing and finishing and heat treating of metals.

GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.



CHIKSAN Swivel Joints illustrated in this installation, facilitate the speedy, economical handling of various fluids through 16 lines from loading dock to manifolding pit — a distance of 800 feet. Since each line leads to a separate tank through the manifold, cross contamination is eliminated.

CHIKSAN Swivel Joints in the pump manifold above enable operator to pull base stock from outside storage into the plant and direct flow to proper vessel or proportioner.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

CHIKSAN Manifolding Saves 3 Ways!

- √ ORIGINAL INSTALLATION
- √ NO CONTAMINATION LOSSES
- √ LOW COST OPERATION

Original cost of CHIKSAN flexible line manifolding installations often run as much as 50% less than fixed line manifolding operations which incorporate costly multiple valve and line systems.

A CHIKSAN manifolding operation is simplified in its entirety — providing complete flexibility, mobility and ease of operation in limited spaces.

CHIKSAN manifolding installations reduce line hook-up time — keep pit floor clear of lines thereby providing greater working areas.

CHIKSAN manifolding operations facilitate the transfer of all types of fluids safely and rapidly under extreme climatic conditions with no possibility of cross contamination.

CHIKSAN manifolding installations are specifically engineered for long life — easy and economical maintenance, and render years of trouble-free operation.

Our Engineering Research and Development Department will welcome inquiries on your manifolding problems.

Write for Catalog 53-C, Dept. 7-OGJ

CHIKSAN

Representatives in Principal Cities

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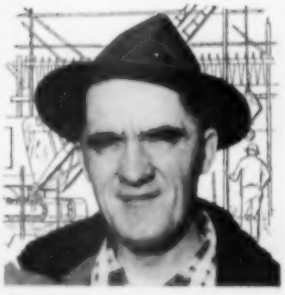
Who gets the money Standard takes in?

Goods and services—cost us $324,743,000. This was spent with thousands of firms, large and small in hundreds of cities.

Crude oil was a big item. To supplement our own large production we bought $135,600,000 worth from crude oil producers.

Wear and tear, depreciation and maintenance amounted to $157,834,000. Millions went to workmen and material firms.



New construction, such as improved refinery facilities, to supply you with more and better products, added up to $145,000,000.

Exploration to replace oil our customers use is costly. Our stepped-up search to find new oil reserves cost us $79,000,000 in 1953.

Employees' wages for time worked took $163,947,000 of our income. Another $43,000,000 went for employee benefits.

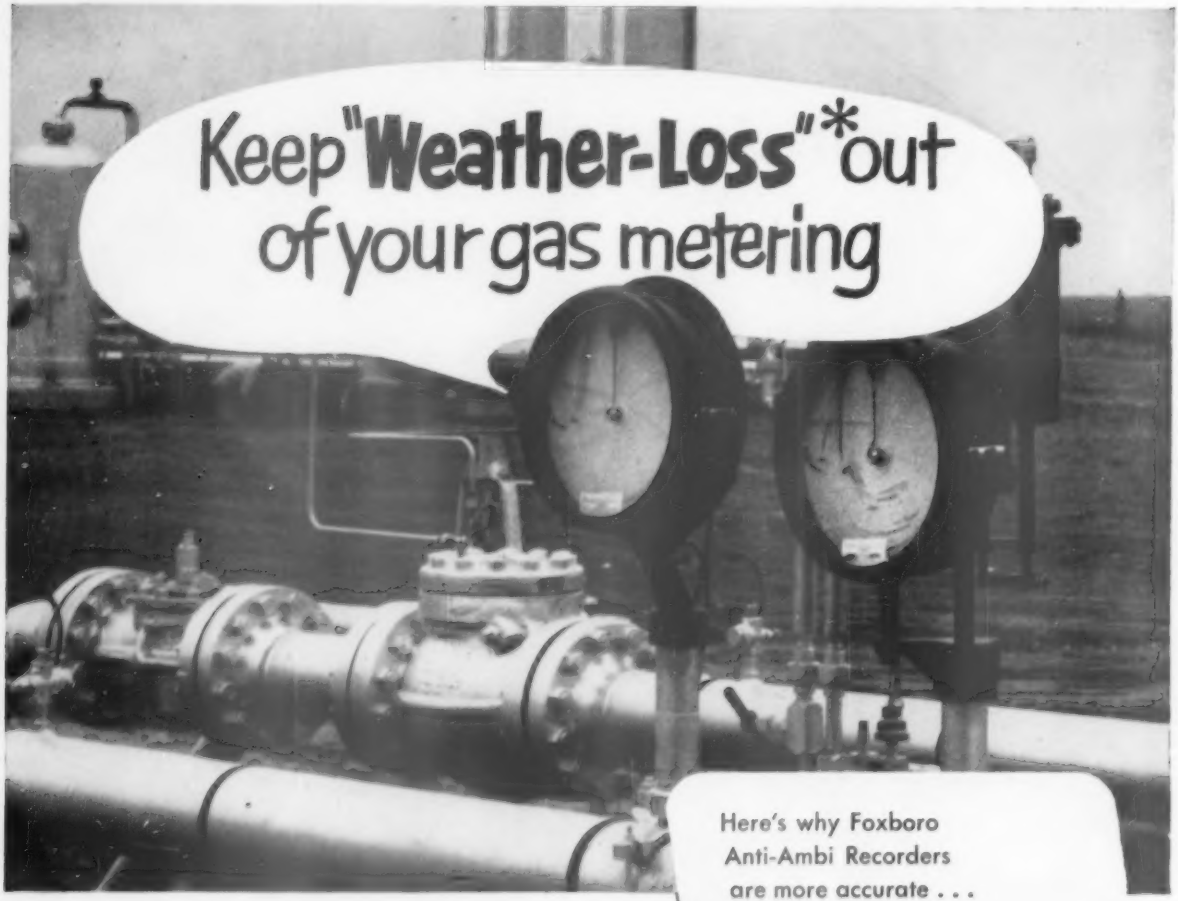
Taxes paid by Standard to U. S., states, counties, cities came to $106,300,000—enough to buy plenty of schools, bridges, etc.

112,000 shareholders' profits came from what was left—$86,020,000 or about 5½¢ for each dollar's worth of Company stock.

Your picture belongs here, too. Because most of the $1,156,757,000 Standard Oil Company of California took in last year ended up with you—the public. Whether one of the hundreds of millions of dollars worth of checks Standard wrote last year was sent to you, or spent with you, or helped make possible better gasoline and oil for your car, you and practically everyone else in the West benefited. Thousands of merchants and professional people in hundreds of towns profited from the pay checks Standard Oilers spent. Our tax payments helped finance schools for your children, parks for vacationers, and bridges for motorists. Carpenters, steelmen, lumberjacks benefited from the facilities we built and the maintenance work we did. It all fits together: 1953 was a good year for Standard because so many of you thought our products well made and worth buying. And by making it a good year for us, you made it a good year for many others.

STANDARD OIL COMPANY OF CALIFORNIA

75 years of planning ahead to serve you better



*Weather-loss is the error in metered gas volume caused by temperature variations. Unless corrected, a variation of 10° F. in gas temperature will cause an error of 1% in metered volume. And that can mean big money losses from season to season. With Foxboro Anti-Ambi Temperature Recorders in your line you eliminate these errors . . . you can compute *actual* gas delivery, regardless of weather conditions.

Like all other Foxboro Instruments, Anti-Ambi Recorders are ruggedly built for accurate, trouble-free performance year after year. Weather-tight case allows outdoor installation. Write for complete information.

The Foxboro Company,
607 Neponset Ave.,
Foxboro, Mass., U.S.A.

Here's why Foxboro Anti-Ambi Recorders are more accurate . . .

This diagram shows the Foxboro automatic compensation for ambient temperatures. Measuring and compensating elements are located in the same case, and capillaries for both systems are in the same protective tubing. Compensating system (B) continuously corrects the primary measuring system (A) for ambient temperature changes.

Here's the small-diameter, quick-response bulb used with the Foxboro Anti-Ambi Thermometer. Bulb is made with a stainless steel neck to reduce conduction effects.

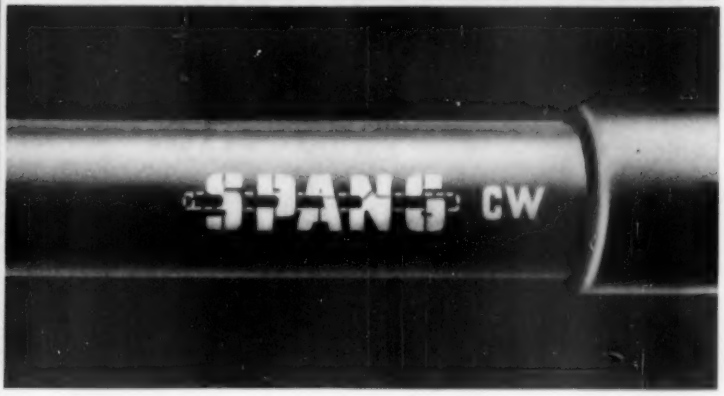
The bulb is generally protected by the special socket shown above. It has aluminum fins for rapid heat transfer, and a stainless steel extension to minimize heat conduction to the socket head.

FOXBORO REG. U. S. PAT. OFF.

Anti-Ambi THERMOMETERS

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

Profit 3 ways with SPANG CW steel pipe in your oil country water systems



You can't beat SPANG CW Steel Pipe for service on water systems, flooding lines and salt water disposal lines! The reason is SPANG *quality control.*

This means that only top-grade steel goes into the manufacturing of SPANG CW . . . close control is maintained throughout forming and welding . . . each length of pipe is rigidly tested and inspected before shipment.

Here's what *quality control* means to you for water system installations in the oil country:

1. **Faster Installation**—*Quality control* makes SPANG CW uniform in every respect . . . makes it easier to cut, bend and thread . . . saves you money.
2. **Greater Dependability**—*Quality control* through automatic control of heat during forming and welding gives SPANG CW strong, clean, uniform welds . . . assures added pipe strength.
3. **Longer Service Life**—*Quality control* means SPANG CW is free of scale inside and out . . . providing smoother corrosion-resistant surfaces, longer life.

These advantages add up to real savings and trouble-free performances in oil country water system installations. And SPANG CW is tops for gas, air and oil gathering lines, too!

You can get SPANG CW Steel Pipe in a full range of sizes from your nearby National Supply Store. Try SPANG CW in your operations. It will pay off for you!

NATIONAL BLUE PRODUCTS

SPANG-CHALFANT DIVISION

THE NATIONAL SUPPLY COMPANY

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NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

Where corrosion resistance is vital

Several years ago, it looked as if a 4200-ft. sour crude well in West Texas would have to be abandoned. The reason: the high sulfur crude was corroding out the pumps too fast. Finally, to hold the lease, the operators decided to try a pump made of Monel®. Using a Harbison-Fischer pump, the well was successfully operated for 18 months. At the end of that time, the well was practically exhausted and no longer economical to operate. But not the pump — when it was removed, threads and working parts were found to be in excellent shape!

Given a new barrel, the pump was installed in another corrosive well, in Arkansas. At last report, it had given one year of additional service. Many similar Harbison-Fischer pumps of Monel construction have served in corrosive wells for four years or longer.

This is only one example of how Monel and the other Inco Nickel Alloys are used to solve tough oil field equipment problems. If your problem involves corrosion by sour crude, brine or acids — or heavy wear, or the physical punishment that most oil field equipment is subject to, it will pay to look into the possibilities of the Inco Nickel Alloys.

At present, it is advisable to place equipment orders with your supplier well in advance of scheduled use. Distributors of Inco Nickel Alloys can supply the latest information on availability from warehouse and mill.

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

7 vital pump parts are made of Monel

The special feature of the Harbison-Fischer "Flexite" Rod Pump is the Flexite rings. Precision-ground to fit the barrel tube exactly, the rings are made of a special hard plastic composition impregnated with graphite. According to the manufacturer, they do not require soaking or prefitting, and will not corrode or disintegrate. They make worthy companions to the corrosion-resisting Monel used for other component parts, such as: cages (1), balls and seats (2), barrel (3), seat frame (4), plunger locknut (5), plunger tube (6), and spacer rings (7). For further information, write to Harbison-Fischer Manufacturing Company, Box 64, Fort Worth, Texas.

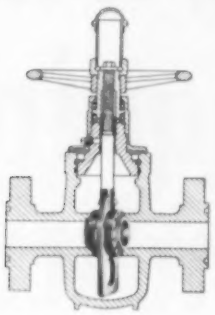
Inco Nickel Alloys

INCO

Monel . . . *YOUR PARTNER IN PROGRESS*

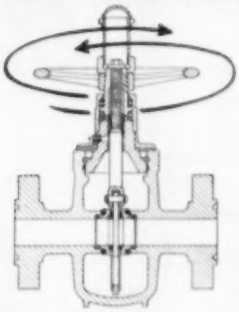
Here's everything you want in a gate valve

POSITIVE SHUTOFF—TIGHT AS A LINE BLIND



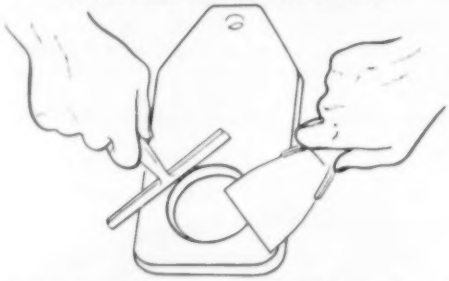
Positive dead-tight seal with pressure on either side of gate. Grove Seal-"O"-Ring Gate Valves also serve as a line blind.

LOWEST TORQUE—OPENING AND CLOSING



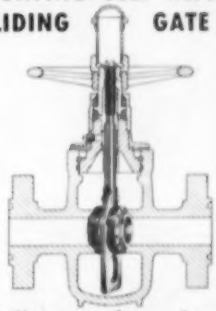
Parallel-sided full-opening port plate is non-wedging, non-galling, non-distorting. Torque required to open or close valve is less than other types of gate valves.

DUAL SELF-CLEANING ACTION



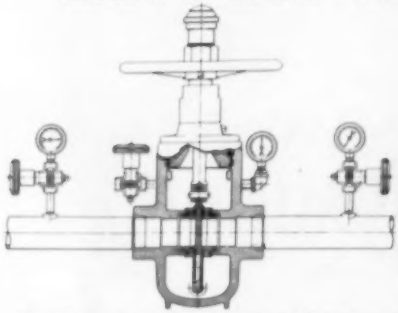
Steel seat assemblies and resilient "O" ring seals are in constant contact with full-opening port plate. Seating surfaces are stripped clean, squeegeed and polished with each operation.

FULL-FLOATING, SELF-ALIGNING FREE-SLIDING GATE ACTION

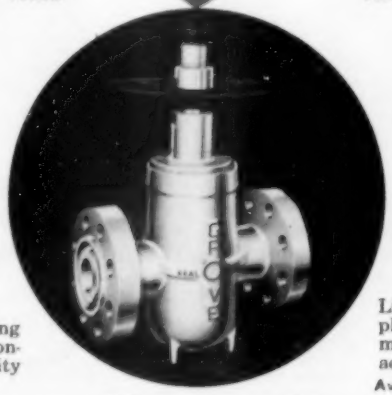


Open, closed or throttling, port-plate and seats are free-floating for perfect self-alignment, constant dead-tight seal, easy sliding action, imposing no strain or stress.

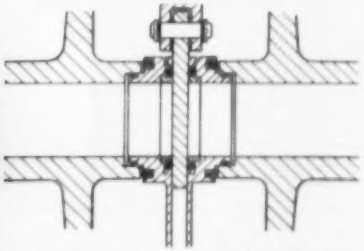
CHECK IT IN THE LINE—ANY TIME



Freedom of gate can be checked by turning hand-wheel, without "breaking" the seal. Non-variance of gauge pressure on body cavity verifies dead-tight seal of valve.



THE GREATER THE PRESSURE THE TIGHTER THE SEAL



Line pressure forces parallel-faced port plate against seat assemblies for positive metal-to-metal seal plus dual sealing action of resilient "O" rings.

Available through leading oil field supply houses

GROVE SEAL-"O"-RING Gate Valves

GROVE REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California

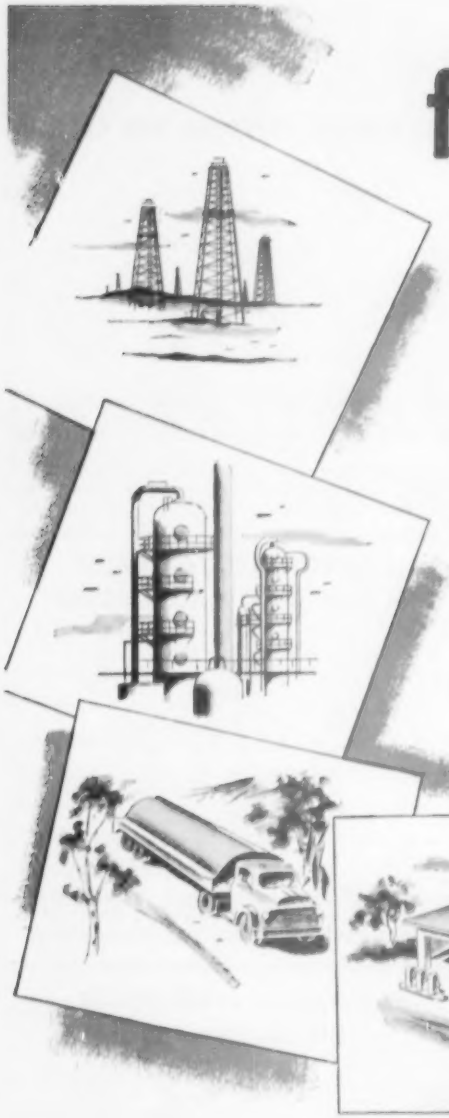
HOUSTON 4—1901 Calumet St. • **LOS ANGELES 6**—1930 W. Olympic Blvd. • **NEW YORK 17**—415 Lexington Ave.

GROVE
SIMPLICITY
ACCURACY
SAFETY

S-404

CORPUS CHRISTI, TEXAS	ODESSA, TEXAS	TULSA, OKLAHOMA	LAFAYETTE, LA.	NEW ORLEANS, LA.	DENVER, COLO.
4534 No. Baldwin Blvd.	114 N. Washington St.	318 Thompson Bldg.	Scott Road	504 Delta Bldg.	2669 Cherry St.

from Rig to Retail "Liquid Aluminum"

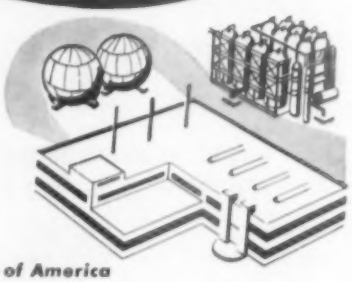


From your field installations to refineries to retail outlets, *Liquid Aluminum* offers low cost protection and cuts maintenance expense. *Liquid Aluminum* is amazingly resistant to money-eating rust . . . resists discoloration from smoke and fumes, too. It reflects up to 85% of heat and light rays . . . reduces evaporation losses . . . minimizes expansion and contraction problems . . . makes interiors brighter and exteriors more attractive. From costly rigs straight down the line to service stations, *Liquid Aluminum* protects and beautifies at modest cost.

Liquid Aluminum is made to approved minimum standards by many leading paint manufacturers. These standards assure you of the best combination of elasticity and durability for longest life on most painting applications. Look for the shining *Liquid Aluminum* foil label on the aluminum paint you choose. See your supplier or write for names of manufacturers to Reynolds Metals Company, 2595 South Third Street, Louisville 1, Kentucky.

ONE COAT PROTECTION FOR YOUR BUILT-UP OR RUSTABLE METAL ROOFS

It's *Liquid Aluminum* with asphalt for roofs. It will add years to roof life . . . and keep buildings cooler in summer to cut air conditioning costs and increase employee efficiency and morale. Look for the shining *Liquid Aluminum* foil label and the special Warranty Seal . . . they are your assurance of the right amount of aluminum pigment in an approved vehicle. Write for folder to address above.



This advertisement appears in the interest of the Paint Industry of America

THE *EXTRA* VALUE IN GRANT REAMERS IS THE 27 YEARS OF *BUILT-IN* FIELD EXPERIENCE!

Here's a round-up of the Grant Reamers designed and built to do your reaming and stabilizing work best. *Think how success or failure of any job can affect your whole drilling program*... how important it is to choose the *right* reamer every time.

That's why you can't take chances on the reamers you use, and why you'll do better with Grant. Grant offers you reamers with *27 years* of continuous down-hole research and improvement *built-in*... experience that you can count on to work best for you when you put Grant Reamers in your string.

Four Grant Reamer body types meet every reaming and stabilizing need. Each type is available with any of four cutter styles for every formation condition—all backed by experience gained in oil fields the world over. *When you ream, ream right with a Grant!*

There's a Grant Service Man near you 24 hours a day, ready to give you fast, efficient service on all your Grant Reamer requirements. Call him—day or night!

Three-Point Near-Bit *Three-Point Regular* *Six-Point Regular* *Nine-Point Near-Bit*

For up-to-the-minute data on Grant Reamers—clip and mail coupon today!

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Grant Oil Tool Co.
2042 East Vernon Ave., Los Angeles 58, Calif.

Please send my free copy of Grant Bulletin 62 which gives detailed information on all Grant Model 1530 Reamer sizes and types.

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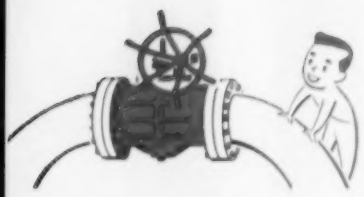
Let's Face the Facts . . .

DOES VALVE LUBRICATION

Now and then someone revives an old argument—"it costs too much to maintain lubricated valves."

On the surface, that sounds logical. But if that really was a fact, millions of Nordstrom lubricated valves in service today could never have been sold.*

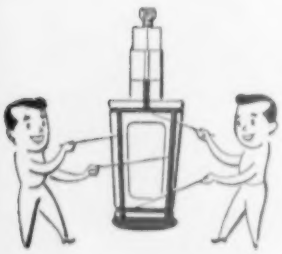
WHAT IS THE ADVANTAGE OF A LUBRICATED VALVE?



The most important function of lubricant in a Nordstrom valve is to give a tighter seal than can be accomplished through any other method yet developed. The thin film of plastic lubricant that is forced around the ports of the plug is a pressure seal in itself.

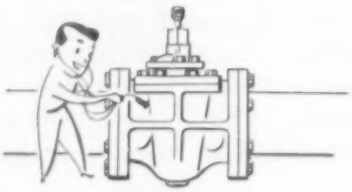
Of course, the lubricant has other obvious advantages--the same advantages it has in your automobile, or in any other mechanical equipment where metal rubs metal. The lubricant all but eliminates the possibility of galling or seizing, and consequently keeps the valve ready to operate in a hurry. A lubricated Nordstrom valve operates easily even against high line pressures, because the plug turns *within* the line, rather than being forced or wedged *against* it. Since it takes only a quarter turn of the plug to open or close the valve, it operates in seconds instead of minutes.

WHAT DOES THE LUBRICANT DO?



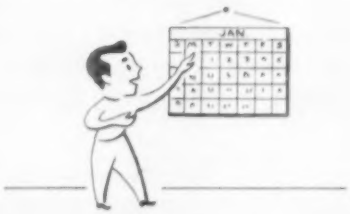
In a Nordstrom valve, lubricant is forced through a series of grooves surrounding the plug ports. There it acts as an extra seal against the little leaks that become big problems. It is also forced into a lubricant chamber at the small end of the plug where it serves as a hydraulic jack to keep the plug easy to turn. Finally, it *lubricates* . . that is, it prevents grinding wear, fills tiny imperfections that may develop, and it lets the plug slide without grating.

WILL A NORDSTROM VALVE WORK WITHOUT LUBRICANT?



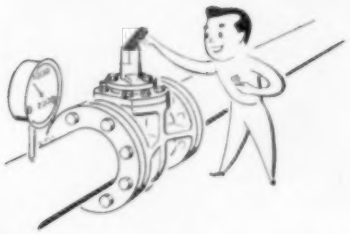
Yes, but then the whole advantage of a lubricated valve is lost. Your car will also operate without lubricant, but with proper lubricant, it is far more efficient, lasts many, many times longer, needs much less maintenance, and is safer. So is a valve. Nordstrom is fundamentally a valve—a plug valve made to exceptional standards of tolerance and quality—but it is the internal Nordstrom lubrication system which raises its performance standards above ordinary valves.

HOW OFTEN SHOULD NORDSTROM VALVES BE LUBRICATED?



Like your car, that depends upon the service—the temperature, process, frequency of operation, etc. It's hard to generalize, but your Nordstrom sales engineer can advise you. Using Rockwell lubricants, made especially for Nordstrom valves, is one way to reduce frequency of lubrication in many cases. Also, Rockwell markets mechanical lubrication equipment to make scheduled lubrication easy. Nordstrom Hypreseal valves are now built with an external fitting so that it is unnecessary to remove any parts from the valve before lubrication.

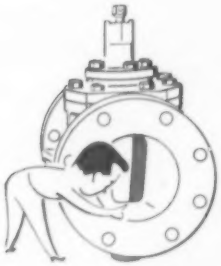
COST MONEY OR SAVE MONEY?



WHAT LUBRICANTS SHOULD BE USED?

Part of the effect of lubricating your car is lost if you use improper lubricants. That is also true of lubricated valves. Genuine Rockwell lubricants will save you money—they are the result of the longest and most extensive research into valve lubricants by any company. They are the result of years of field experience with nearly every process condition. For many services there are variations of Rockwell lubricants compounded to offset specific line conditions. Also, for many services Rockwell Hypermatic lubricant may be recommended. This lubricant, which is compressible and energizable, regenerates itself in the lubrication system, greatly reducing lubrication frequency. In any case, consult your Nordstrom sales engineer.

HOW LONG WILL PROPERLY LUBRICATED NORDSTROM VALVES LAST?



That's impossible to answer, since many of the first Nordstrom valves put into regular service are still going strong. The service has a lot to do with it, naturally. In gas service, there are many valves with more than 30 years service. In the valve-killing application of drilling rig mudlines, Nordstrom valves have been disassembled for inspection after more than 150,000 feet of hole on many occasions, found to be without wear, and returned for more service—often four times the life of ordinary valves. In a two-year paint plant test, Nordstrom valves were the only ones that did not need to be replaced because of leakage. Nordstrom files are full of such authentic field case histories—ask your Nordstrom sales engineer.

WHAT ABOUT MAINTENANCE COSTS FOR NON-LUBRICATED VALVES?

In any but the most simple services, any kind of valves need *some* maintenance. But in the case of Nordstrom valves, maintenance is generally confined to adding lubricant at intervals. Over a 20-year period, Nordstrom sales of repair parts have been less than half of one per cent of sales. In several plants in which records were kept and where Nordstrom and other valves were used, repair parts for Nordstrom valves ran about one-tenth of other makes.

The analogy to your car carries over here—if you don't lubricate it, you save on lubricant, but pay the far, far higher costs of part replacement. And more particularly, you'll need a new car much more often.

When you consider valve maintenance, be sure to count *all* the costs—not just simple service, but major repairs and complete replacement costs, shutdowns, extra labor to operate, and *all* factors.

If you do, if yours is a typical application, you'll find that year-in and year-out, the most economical valves you can use are Nordstroms.

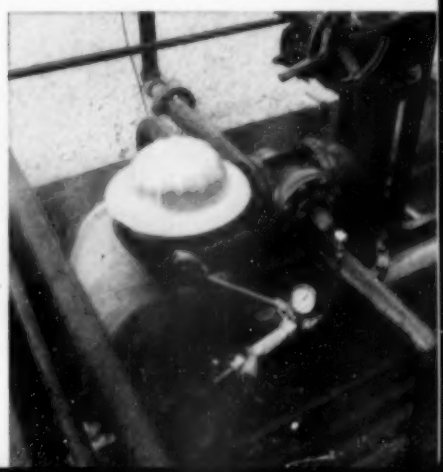
If you'd like to discuss the suitability of Nordstrom valves for any service, let us know. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers, Limited

ROCKWELL- Nordstrom VALVES

Lubricant-Sealed for Positive Shut-Off

* Nordstrom invented lubricated valves more than 30 years ago. Since that time, several million have been installed in hundreds of widely varied petroleum, gas, chemical and other process services. With by far the most complete range of sizes and pressures, and many patents on construction details, Nordstrom is the leader in lubricated valves.



SERVING CANADA'S

Oil Industry

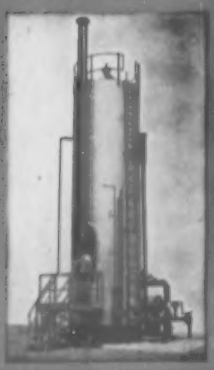
In field and refinery operations custom steelwork by Dominion Bridge plays an important role. Our Western plants have been expanded and re-equipped to meet the growing needs of Canada's thriving oil industry—including complete facilities at Edmonton for the fabrication of Class I welded refinery pressure vessels. Some examples of our work are shown below.

Write to Box 280, Montreal, for fully illustrated Booklet BSE "Builders in Steel".

DOMINION BRIDGE COMPANY LIMITED

FRACTIONATOR TOWERS

TREATER UNITS



PUMPS

OIL STORAGE TANKS

DIVISIONS: STRUCTURAL, PLATEWORK, BOILER, MECHANICAL, WAREHOUSE

Plants at: MONTREAL, OTTAWA, TORONTO, WINNIPEG, CALGARY, VANCOUVER,

Assoc. Companies at: AMHERST, N.S. QUEBEC, SAULT STE-MARIE, EDMONTON

Tornado hit here?

People in Lima, Ohio, couldn't even notice a dim-out of industrious sparkle in the lights of Sohio's refinery. On that night, though, hundred-mile-an-hour winds from a nearby tornado knocked out one of the refinery's two, 34-kv utility feeder lines. The "cat cracker's" 3000-hp blower motors were thrown out of synchronization and started an ominous whining slowdown.

In less than 4 seconds, three things happened: a Westinghouse Under-Frequency Relay took the motor drives off the line, so that the rest of the plant load could be reapplied in segments. DH air circuit breakers in

(continued next page)

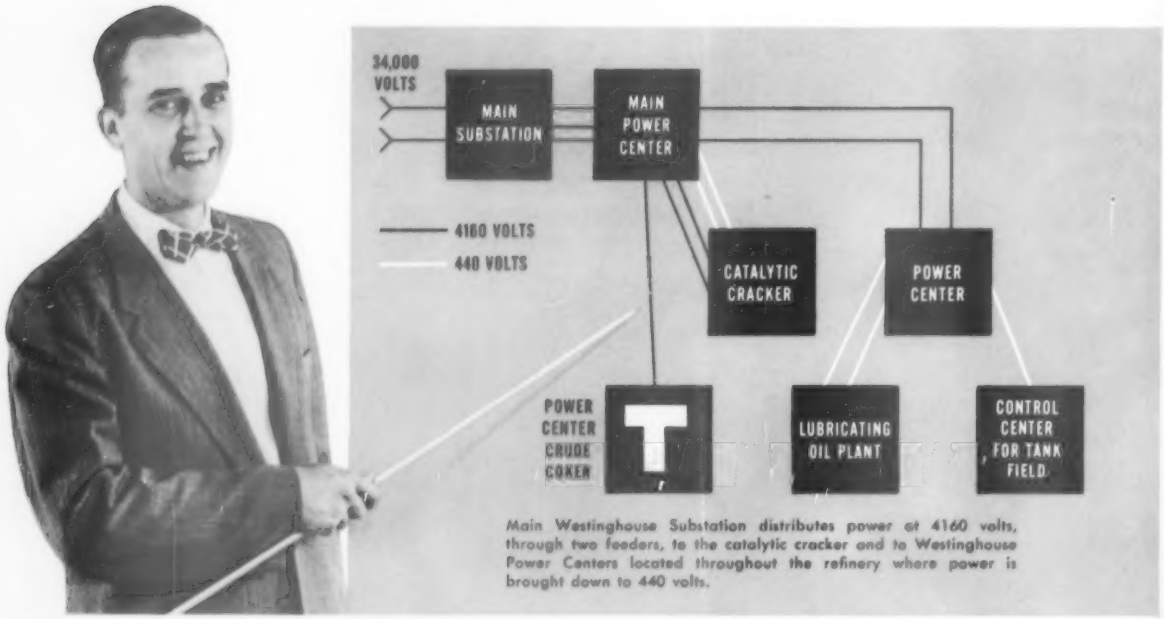
Meet Carl Olson, Westinghouse Industrial Engineer, who reports on how a new conception of power reliability resulted at Sohio's Lima Refinery through electrical distribution and drive control.

the main Westinghouse Switchgear automatically closed, bringing power in from the second utility feeder. Automatic control restarted the blower motors and a $30,000 outage was averted.

This absolute electric power reliability was the result of thorough planning by Sohio Engineers, the Dingle-Clark Co., and Westinghouse. They decided that quick restoration of power is the most efficient method of assuring continuous production from the refinery process. An ingenious control system was installed to automatically clear trouble in 4 to 5 seconds. The resulting electrical system brought important advantages in flexibility, economical operation and simplified maintenance.

At Sohio's Lima Refinery . . .

Speedy restoration of service is key to process protection



Main Westinghouse Substation distributes power at 4160 volts, through two feeders, to the catalytic cracker and to Westinghouse Power Centers located throughout the refinery where power is brought down to 440 volts.

Westinghouse 4160-volt Switchgear, left, is located in the main substation protecting refinery load of 16,200 kva. It provides under-frequency and automatic-starting control for the main blower motors.

Drawout feature of these high-voltage, Type DH, De-ion® circuit breakers allows them to be changed in only 3 minutes. Inspection and maintenance can be made simply and quickly with minimum disturbance to refinery operations.

. . . System growth at low cost results

The refinery's present duplex system is so planned that Sohio can add additional capacity easily in the future. Sohio engineers point out that they are now using 16,200 kva, and can go up to 25,000 kva without adding additional switchgear.

Standard, unitized construction of Westinghouse Substations and Power Centers will make it easier to expand or rearrange circuits when needed.

Westinghouse Power Centers add economy

Sohio engineers report that the compact and completely enclosed design of Westinghouse Power Centers permits installation near the centers of refinery load with resulting savings in power and cable, and at the same time conserves building space. Voltage loss at distant locations, such as tank-field pumping stations, is prevented. Motor drives operate efficiently at full rating.

Maintenance man-hours limited

On low-voltage circuits Westinghouse AB-I Circuit Breakers cut down maintenance time with 3-step protection. First, these breakers will not trip on light or short-duration overloads. Second, they will trip immediately in case of serious fault, but once the fault is cleared a flip of the breaker handle restores power. There is no time lost locating replacement fuses. Third, AB-I breakers always remain properly calibrated. There's no danger of under or over fusing.

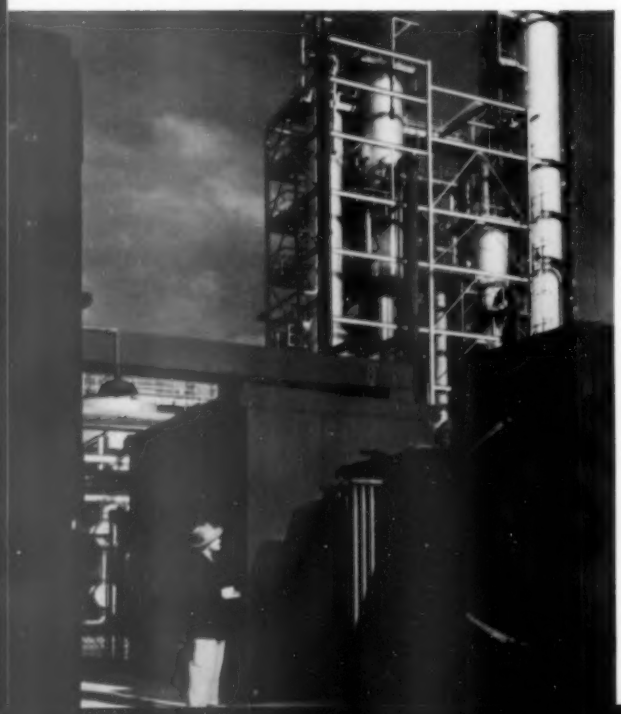
Westinghouse Field Engineering plays a part

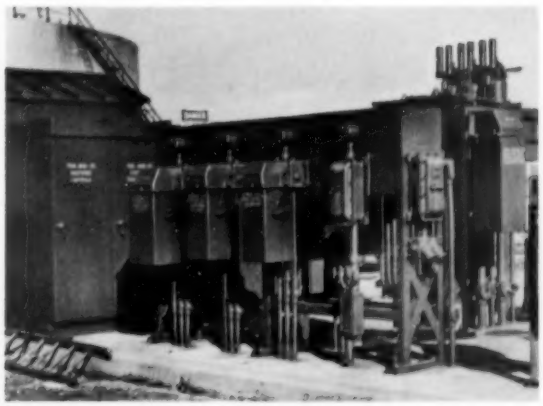
In the event of major electrical equipment damage, Sohio can always rely on Westinghouse Field Engineering Service. Available from 56 Field Service Offices, Westinghouse Engineers are on 24-hour call to take care of emergencies.

In addition, 38 Westinghouse Manufacturing and Repair Plants provide factory-type service. And 31 Westinghouse Renewal Parts Warehouses help to simplify many refinery inventory problems on electrical equipment.

Next page, steam or electric drives . . . how the decision was made.

YOU CAN BE **SURE**...IF IT'S Westinghouse





Oil-immersed, combination Life-Line Starter and AB-I circuit breakers are grouped together providing control and circuit protection for pump motors. Units are easily inspected by lowering oil tanks.

Westinghouse 440-volt, Outdoor Power Center for the Lubricating Oil Plant contains two 1000-kva transformers, 4160/440 volts, and 440-volt air breaker switchgear.

for continuous operation of Sohio's Lima Refinery . . .

Electric drives show lowest cost

Thorough study showed electrical drives to be the most economical way to expand Lima Refinery capacity to 50,000 bbls. per day. Westinghouse experience in supplying both steam and electric drives helped to point out lower electrical installation and operating costs.

Refinery operating efficiency is improved with the help of Westinghouse Motors and Control for the "cat cracker" blowers and synchronous motors on the Lubricating Oil Plant refrigeration compressors. These synchronous drives improve the system power factor and deliver more power per dollar.

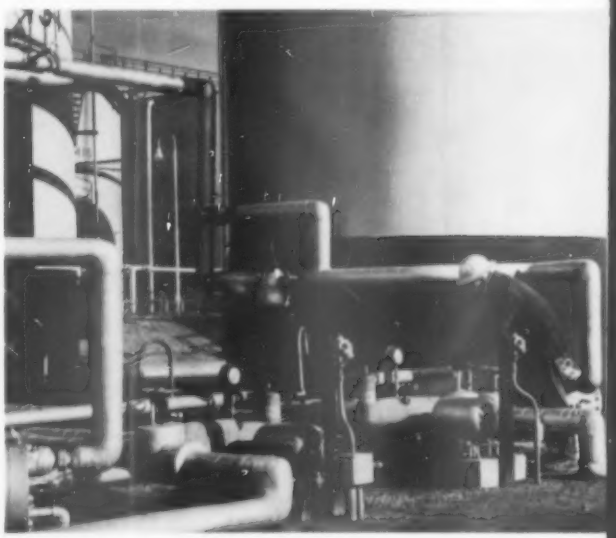
Life-Line® motor drives in the Lubricating Oil Plant and tank field require minimum attention. Sealed, pre-lubricated bearings and tough conductor insulation protect them from dust, moisture and corrosive action.

In analyzing refinery drive requirements, Westinghouse Engineers can help you with complete impartiality, too. Whether steam or electrical equipment proves more desirable, Westinghouse engineering provides dependable facilities for continuous refinery operation.

What to do NOW! Call your local Westinghouse Representative with questions on any of the equipment discussed. He'll supply you with copies of the literature listed below. Or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

- ☐ Power Centers B-4162
- ☐ High-Voltage, Metal-Clad Switchgear B-5306
- ☐ Low-Voltage, Metal-Enclosed Switchgear B-5282
- ☐ Dry-Type Transformers B-5920
- ☐ AB-I Circuit Breakers B-5456
- ☐ Preventive Maintenance Booklet B-5477
- ☐ Synchronous Motors and Control B-5300
- ☐ Motors and Control for Petroleum Industry B-5444
- ☐ Life-Line "A" Motors B-6154-A
- ☐ Life-Line Motors (200-700 hp) B-4731
- ☐ Large Induction Motors B-4739
- ☐ Complete Industrial Control and Services B-6051

Two Westinghouse 250-hp, 4160-volt synchronous motors with special enclosures operate safely in hazardous atmosphere. Westinghouse Engineers designed special hoods for purging the motors continuously with fresh air.



Pumping operations in the tank field are powered by Life-Line motors. Sealed, pre-lubricated Life-Line bearings eliminate the time and cost of greasing maintenance, prevent entry of dirt and moisture into the bearing. MP-3031

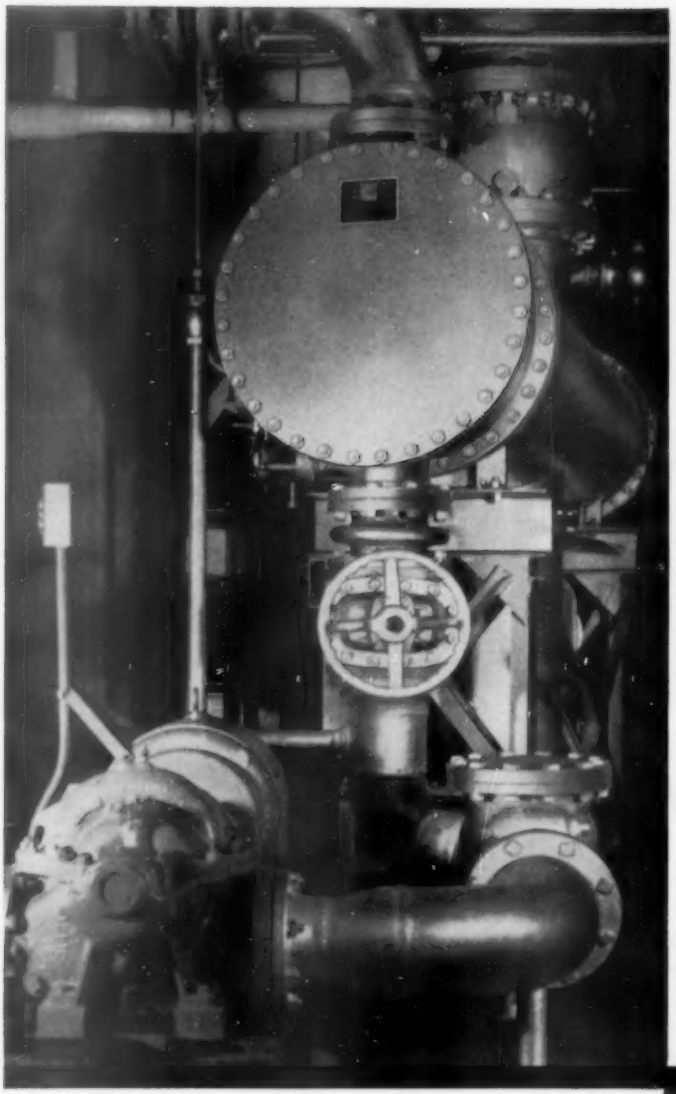
YOU CAN BE **SURE**... IF IT'S

Westinghouse

ON DUTY...

in Connecticut State Hospital's new power plant

ROSS SURFACE CONDENSER



With a staff of 982 employees and care facilities for 3,016 patients, the Connecticut State Hospital, Middletown, Conn., is one of numerous institutions, public utilities, office buildings, refineries and other industries served by Ross Surface Condensers. Here, the Ross unit condenses the exhaust from a 500 kw turbine generator set, producing 26 in. Hg. vacuum.

Because it has engineered and built so many condensers: standardized, special and packaged units . . . because it has originated so many "firsts" in condenser design, the Kewanee-Ross organization is uniquely qualified to be of maximum service in planning, designing and fabricating surface condensers for your requirements.

Why not consider Kewanee-Ross in your next installation? Word from you will bring a Kewanee-Ross representative to your plant with valuable data on surface condensers and exchangers, whatever your requirements may be.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1417 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

Pioneer of all-welded steel surface condensers

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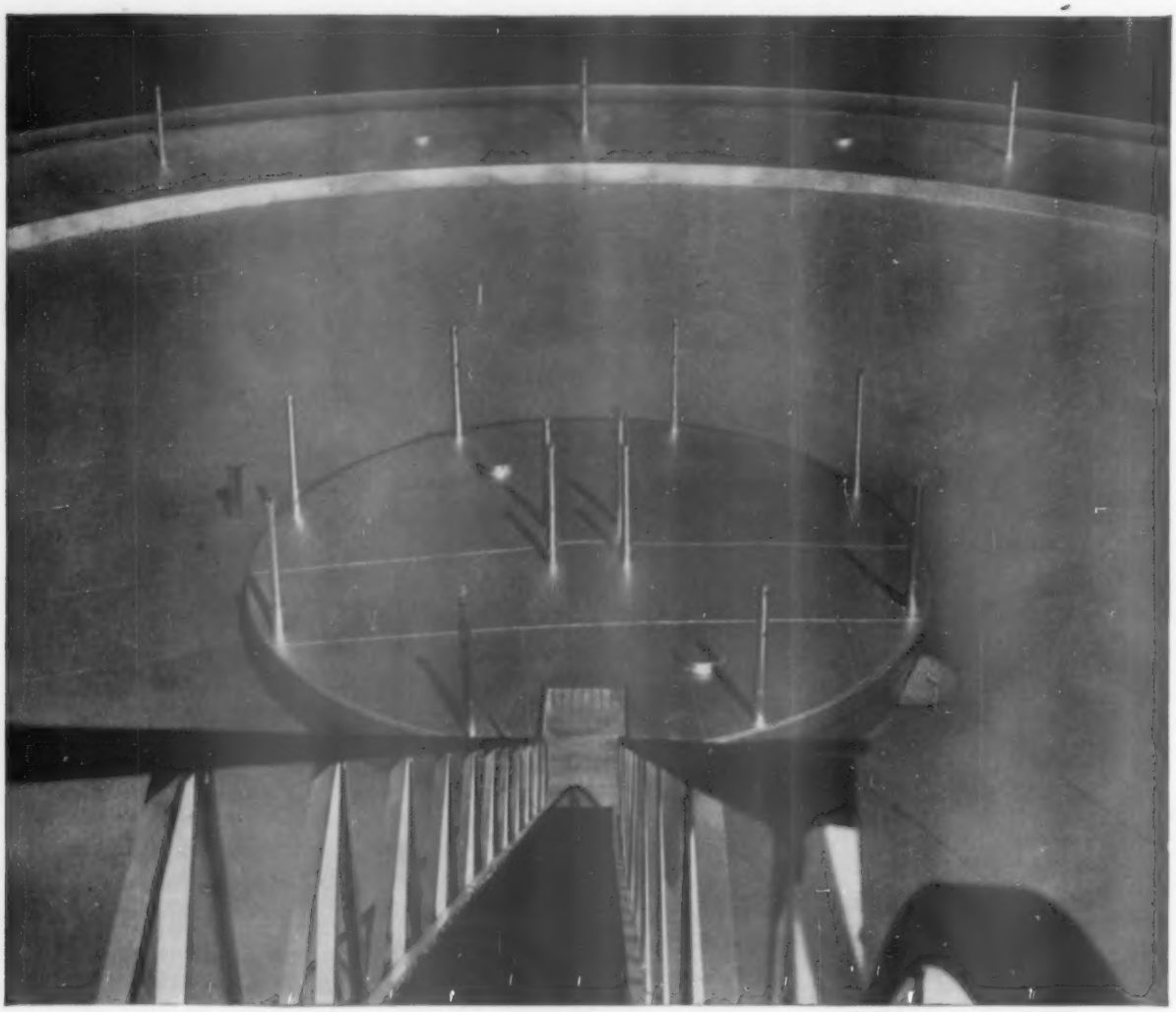
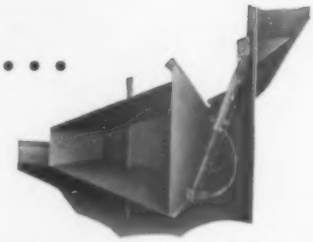
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS



You are looking down . . .

into a Graver Center-Weighted "Floater." It's a well-built tank especially designed to conserve volatile vapors by means of Graver's own "Vapor-Stop" Seal—the improved seal which maintains firm closure between the floating roof and the shell. This patented Graver seal mechanism is an integral part of all Graver Floating Roof designs. It is flexible, yet firm—tight, yet responsive. It provides centering action for the roof and prevents the entrance of air and rain. From time to time you may expect similar technological improvements from Graver . . . where increasing emphasis will continue to be placed on research and development.



Graver's "Vapor-Stop" Seal!

The seal is free and limber, yet continues to close the gap and prevent loss of vapors. It is successful on both converted tank shells and new construction.

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. . . a conservation design to fit every need

GRAVER TANK & MFG. CO., INC.

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HOUSTON · CATASAUQUA, PA. · SAND SPRINGS, OKLA. · CASPER, WYO. · ODESSA, TEXAS
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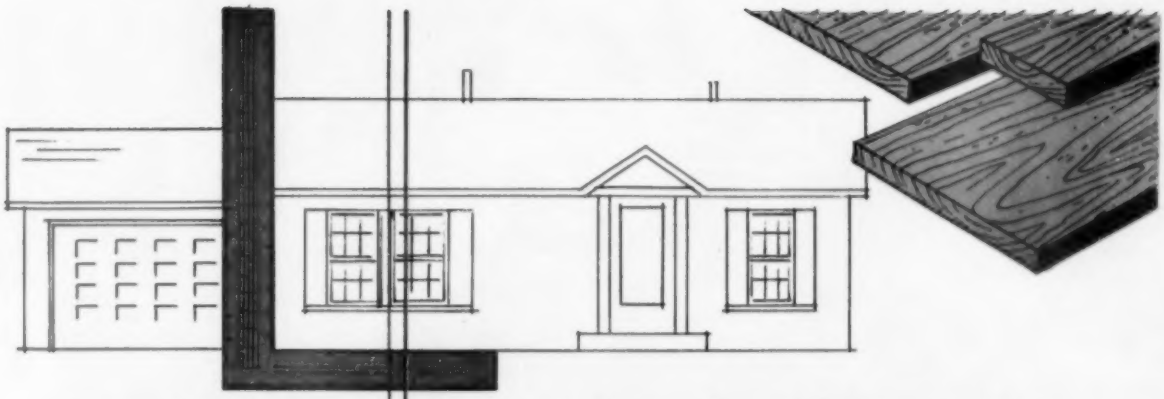

HOUSES BUILT AT A FACTORY...

YOUR *BEST* BET FOR OIL FIELD HOUSING . . .

STURDYBILT Prefabricated Houses are precision built *at the factory.* Top grade, seasoned lumber is used exclusively; and each prefabrication section is made to fit with every other section.

You can choose from many standard designs that will fit every housing need, large or small. Whether you need one small lease house or an entire oil field camp, one purchase order takes care of plans, construction, transportation and erection. What's more your factory-built STURDYBILT houses can easily be moved from one site to another with little or no loss of material.

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● MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS: CURTIS WOODWORK

STURDYBILT

PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. ● TULSA, OKLAHOMA

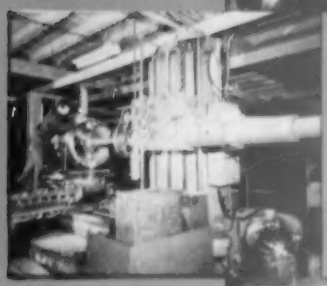
STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Here in our Tulsa plant, home of Climax Controls, the Product Development Group translates new concepts of automatic control into final engineering drawings for equipment to meet the precise requirements of tomorrow's Process Industries.

Here's Why BS&B CLIMAX CONTROLS give such *Outstanding Performance!*

Only the most advanced engineering and design...the most modern manufacturing equipment and methods ...the most exhaustive test procedures...and years of practical experience and "know-how" in the industry can combine to produce controls of the quality, precision, long life, efficiency and reliability that you get in Climax! The excellence of BS&B Climax Controls has gained for them a world-wide reputation—for nowhere in the world will you find a better line of automatic process controls...or a company which takes more care and pride in their manufacture! When next you need control equipment for a new installation or for replacement purposes, be sure to specify BS&B Climax...you'll be glad you did!

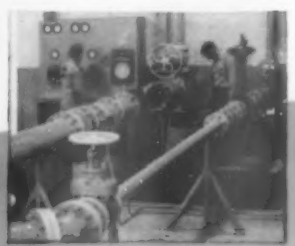
Many different metals are required in the making of Climax Controls. Sizable stocks of steel bars and tubing are maintained in the plant at all times.



A large investment in highly specialized equipment is required to enable us to manufacture Climax Controls in a full range of types and sizes, from the smallest to the largest.

Our skilled machinists and craftsmen take great pride in their ability to turn out consistently fine quality precision work to the customer's most exacting tolerances.

When required, finished parts are heat treated in these precisely controlled electric annealing furnaces—some of the most modern of their kind anywhere in the world.



To assure maximum on-the-job efficiency, every Climax Control must pass rigorous operating tests in one of the industry's most modern hydraulic and experimental laboratories.

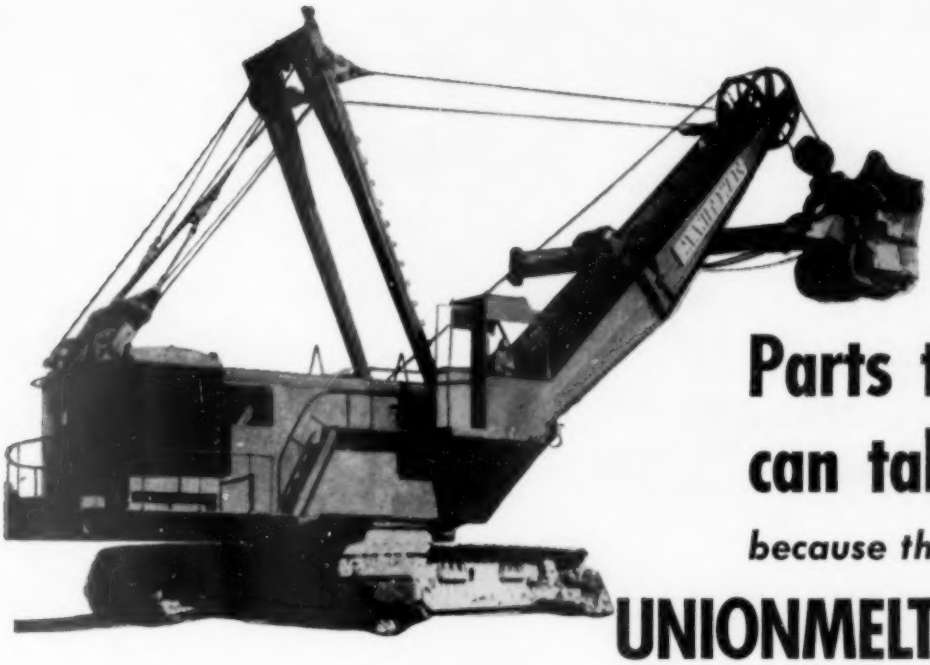
EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

BLACK, SIVALLS & BRYSON, INC.

Climax Controls Division, Dept. 4-A7

7500 East 12th Street

Kansas City 26, Missouri



Parts that can take it...

because they're UNIONMELT Welded

Dipper sticks have to be strong to absorb severe stresses. That's one reason why the three main sections of this part are UNIONMELT *welded. Sound welds can be made in metal up to 3-in. thick in a single pass.*

A power shovel dipper stick has to be strong. It must withstand severe banging, twisting, and bending stresses as its huge scoop bites out hundreds of tons of earth and rock in each day's operation. But these dipper sticks can take it—they're made by UNIONMELT welding.

Strong, clean UNIONMELT welds can be made in metals up to 3-in. thick in a single pass. There is no limit to the metal thickness that can be joined by multiple passes.

Research and years of experience have helped LINDE to develop a top notch team of fabricating processes—HELIARC, sigma, and UNIONMELT welding. For small shops or huge production lines, from carbon steel to complex alloys—there is a LINDE electric welding process to do the job. Your local LINDE representative will help you determine the best welding process for your job. Call him today for more information.

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A Division of Union Carbide and Carbon Corporation
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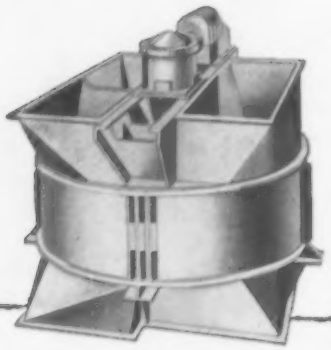
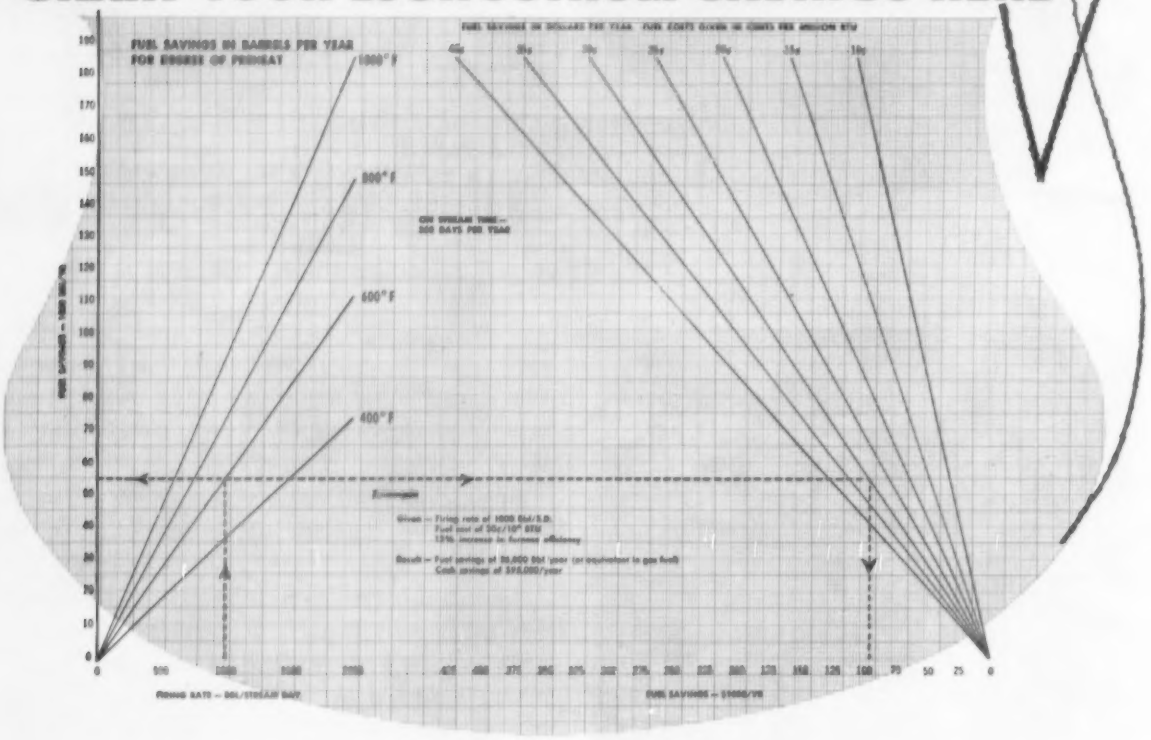


CHART YOUR LJUNGSTROM SAVINGS HERE


FUEL SAVINGS IN BARRELS PER YEAR FOR DEGREE OF PREHEAT
1000° F
800° F
600° F
400° F
ON STREAM TIME — 300 DAYS PER YEAR
Example
Given — Firing rate of 1000 Bbl/S.D.
Fuel cost of 50¢/10⁶ BTU
15% increase in furnace efficiency
Result — Fuel savings of 30,000 Bbl year (or equivalent in gas fuel)
Cash savings of $90,000/year
FIRING RATE — BBL/STREAM DAY
FUEL SAVINGS — $1000/YR

Start at the firing rate in your process units . . . allow a reasonable amount of air preheat (the higher the preheat, the more you'll save) . . . and look to the left for fuel savings. To convert that figure to cash — *move to the right to your fuel cost line, and check your savings directly below.*

The savings you'll discover for yourself are not fantasy, either. They simply prove why a Ljungstrom Air Preheater will pay for itself in eighteen months . . . a year . . . even nine months or less —in fuel savings alone!

And that isn't all. When you add to this the increased production . . . higher product quality . . . decreased furnace maintenance typical of operations including a Ljungstrom — you'll see why the Ljungstrom Air Preheater can be the oustanding factor in your refinery for *top economy and throughput*. Write today for full details.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

See this new J-M Packing at your field store today!
KEEP YOUR SLUSH PUMPS WORKING... Save ON REPACKING!
with
Johns-Manville
WILDCAT
(CUMPAC NO. 239)
ROD PACKING
Lasts Longer • Seals Tighter
Reduces Rod Scoring
Look for this counter-card display of J-M Wildcat Packing—now in stock at most field stores and supply houses

Cuts downtime . . . goes on fast
. . . withstands abrasives and corrosives

"It's a wildcat for punishment," say tool pushers and drilling contractors. They find that J-M Wildcat Packing stands up longer than other packings—keeps slush pumps operating with less repacking—reduces rod scoring to the minimum.

Wildcat (Cumpac® Style No. 239) is a custom-moulded, semi-automatic packing, made of special tough, resilient compounds to withstand abrasives and corrosives in oil field operations. Easily installed, comes in sizes for all slush pump stuffing boxes. For more details ask Johns-Manville for Wildcat folder PK-77A. Write Box 60, New York 16; in Canada, 199 Bay Street, Toronto 1, Ontario.

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Johns-Manville PACKINGS & GASKETS

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World's most modern truck engines

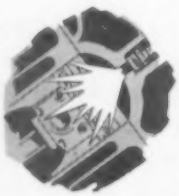
Yours only with...

Never before in history has there been a truck engine like this! The new Dodge truck Power-Dome V-8 gets full power from regular gas, offers more miles to the gallon, operates at higher efficiency than any other mass-produced V-8! See your dependable Dodge truck dealer *today!*

Features of the future . . . found only in Dodge today!

Exclusive V-8 Power-Dome Combustion!

Unique dome-shaped heart of the Dodge truck V-8 develops more energy, expands gases more fully, wrings more power from every drop of fuel! Means top power now and for years to come!



Thrifty-powered Dodge truck 6's, too!

Famous-for-economy 6's also are found throughout the Dodge truck line. Twin carburetion and increased horsepower on many Dodge truck Sixes! Known everywhere for dependability.

DODGE "Job-Rated" TRUCKS

A BETTER DEAL FOR THE MAN AT THE WHEEL

One of a series saluting oil producing areas.

Getting to the bottom of things in OKLAHOMA

Operators in the Sooner State of Oklahoma are relying more and more on the penetrating speed of CP Three Cone Rock Bits to "get to the bottom" faster. And with good reason! Ruggedly built, CP's are designed to afford deep cutting action with each turn of the drill stem. Available in six different types, there's a CP bit for every kind of formation whether it be extra soft or exceedingly hard and abrasive. Write, *Chicago Pneumatic Tool Co., Oil Tool Division, 5000 U.S. Highway 81 South, Fort Worth, Texas.*

Chicago Pneumatic

GENERAL OFFICES: 8 East 44th Street, New York 17, N. Y.
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THREE CONE BITS • REAMING BITS • REAMERS • DRILL COLLARS • TOOL JOINTS • SUBS • JUNK BASKETS

This Goulds 4-stage 6" Fig. 3360 pump serves the Benton oil field water injection system at 600 PSI.

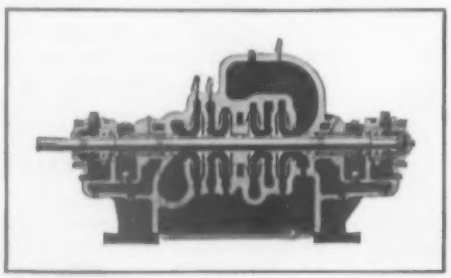
Water flooding recovers 5 million barrels of "bonus" oil in four years

When the Benton oil field's production dropped sharply after 8 years of pumping, the Shell Oil Company converted 107 of the 260 wells in the field from oil production to water injection.

In the first four years of water flooding, more than 33 million bbls. of water have brought up about 5 million bbls. of oil—with an estimated "bonus" of 16 million still to come.

Five Goulds pumps serve the injection system. The principal one is a 4-stage 6" Fig. 3360 bronze-fitted pump which pumps 29,000 barrels of water into the injection wells every day, at a pressure of 600 PSI. Two Goulds 2-stage 4" Fig. 3390 pumps, connected in series, serve as standby for the main pump. And two Goulds 6" Fig. 3460 all-bronze pumps circulate water through the treating plant.

There are Goulds pumps to fill virtually every requirement in the oil industry. Goulds engineers will be glad to help you select the right types and sizes for your specific needs and to consult with you on any installation problem. Writing direct to Goulds Pumps, Inc., Seneca Falls, N. Y., will bring prompt action.



Cross-section of the 4-stage Goulds Fig. 3360 pump, showing opposed impellers for hydraulic balance, and other features designed for operating efficiency and maintenance economy.

MEMBER

Goulds PUMPS INC. Seneca Falls New York

They Say—

More, Not Less Gas News

Dear Sir:

At one time you carried a news feature in The Oil and Gas Journal on natural gas. This feature was most helpful to me and I had been hoping that the feature would again appear in your magazine.

Glenn O. Ladd
Rate Engineer
Arkansas-Missouri Power Co.
Blytheville, Ark.

Editor's Note: The Journal has increased rather than diminished the amount of gas news carried, but it isn't in its former location. In an attempt to make the Journal more readable, all natural-gas news formerly carried in the back of the magazine on the "Natural Gas" page, has been moved to the front "News" section. Formerly short items appeared in the back, longer items in the front. The change was made to avoid splitting our gas coverage. In the June 21 issue, for example, there appeared in the News section 75 column inches of gas and natural-gasoline news items, not including international. The gas page previously carried could accommodate fewer than 30 inches. The June 14 issue carried 102 column inches.

Midland Marching

". . . Just think of it—two flowing wildcat discoveries and a field-extender completed in a single day in Midland County. And only a few years ago there were persons who said they would drink all the oil ever produced in this county. The county now produces approximately 1,225,000 bbl. of oil per month, with the figure rising steadily. A very tall drink, indeed!"

Editorial in the Midland Reporter-Telegram.

TIPRO and the Phillips Case

". . . Now that the Supreme Court has seen fit to broaden the authority of the FPC to regulate the well-head price of gas going into interstate commerce, we have no choice in our own self defense but to authorize state minimum price legislation. If we didn't know before, we do now that the only way Texas and Texans will ever realize anything approaching the real value of this great natural resource is to instruct our own state railroad commission to set mini-

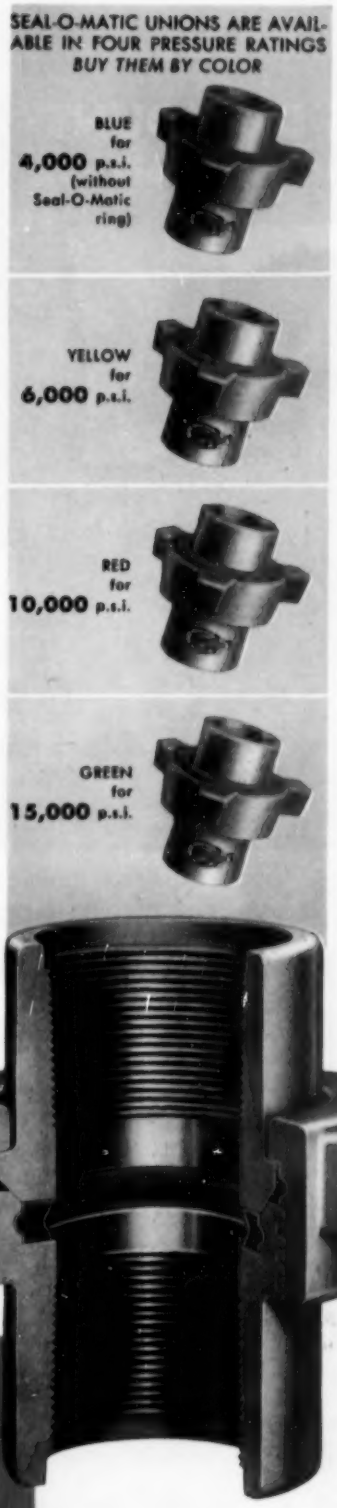
A Union of Quality and Strength

GUIBERSON SEAL-O-MATIC UNIONS

High in strength because they are high in quality, Guiberson Seal-O-Matic Unions are rugged, heavy duty couplings that stand up to the severest tests.

Double-sealing Seal-O-Matic Ring and metal to metal seat hold working pressures securely. Seal-O-Matic Ring is molded from special oil resistant compound that will not deteriorate in oil, gas or under pressure. All metal parts are made of high tensile alloy steel, accurately machined to assure interchangeability.

Quick and easy to make or break, Seal-O-Matic Unions are ideal for a multitude of uses ...with minimum upkeep and positive, leak-proof seal.


SEAL-O-MATIC UNIONS ARE AVAILABLE IN FOUR PRESSURE RATINGS
BUY THEM BY COLOR
BLUE for 4,000 p.s.i. (without Seal-O-Matic ring)
YELLOW for 6,000 p.s.i.
RED for 10,000 p.s.i.
GREEN for 15,000 p.s.i.

Regular Unions have line pipe thread. Also available in EUE 8 round thread.

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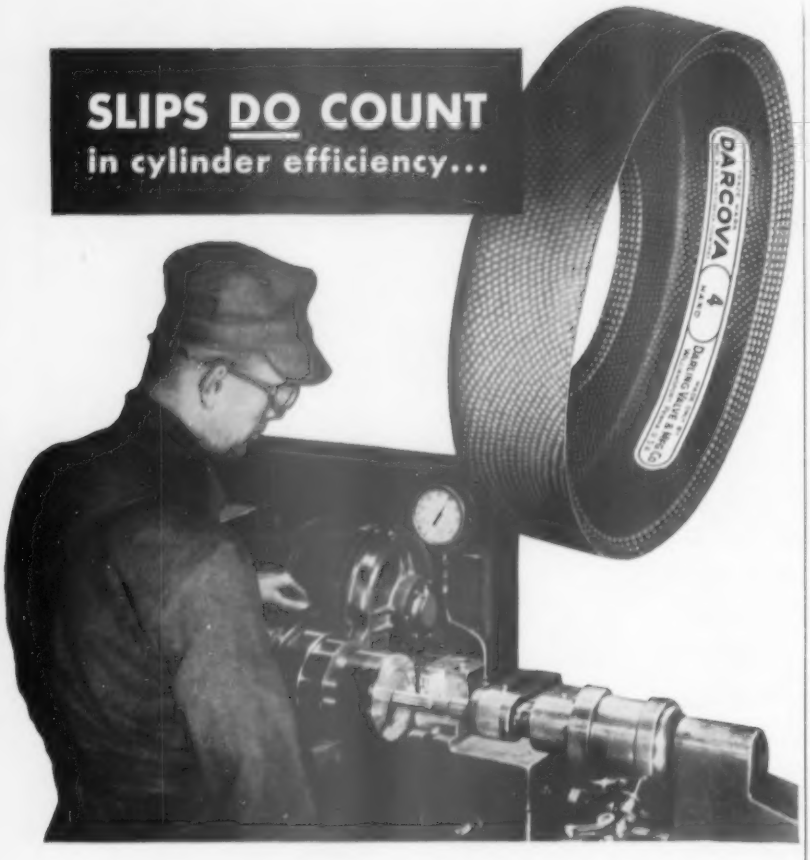
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere



Now, cost-conscious engineers are standardizing on **DARCOVA PUMCUPS!**

Reason—On all types of air and hydraulic controls and mechanisms maximum volumetric efficiency is assured with Darcova Pumcups. Moreover, Pumcups outlast ordinary packing at least 3 to 1!

CHECK THESE OTHER ADVANTAGES TOO!

- Reduced operating speeds
- Fewer shutdowns
- Smoother operation
- Lower power costs
- Longer cylinder life
- Closer control

If your slippage is showing, write for Bulletin No. 4502 on Darcova Pumcups for air and hydraulic mechanisms . . . or Bulletin No. 4401 on Pumcups for reciprocating pumps.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
PUMCUPS

mum prices in individual fields where necessary to conservation. . ."

Jack Woodward, president of Texas Independent Producers and Royalty Owners Association, in a statement following the Supreme Court decision in the Phillips gas case.

Figures on Supply Companies

". . . The supply companies have an average inventory of $190,000 per store . . . they also have an average number of 12 employes per store, and 35 per cent of their employes operate in motor vehicles. . ."

D. D. Bovaird, president of Petroleum Equipment Suppliers Assn., in a speech at Chicago before the Oil Buyers Group of the National Association of Purchasing Agents.

Miles of Autos

"We have built more miles of automobiles since 1945 than we have miles of highway. If we were to place all the new cars produced since 1945 bumper to bumper and laid alongside of them every mile of highway we have built since, the cars would stretch farther than the roads."

Arthur O. Dietz, president of C.I.T. Financial Corp., in an address before the Economic Club of Detroit.

A Pat From A Pipeliner

Dear Sir:

We wish to thank you very much for your consideration and a very attractive layout and explanatory information as to the installation of our pipeline and stations.

We certainly compliment you on this presentation. . .

J. L. Shakely
President
Oklahoma Mississippi River
Products Line, Inc.

Spindletop and Shell

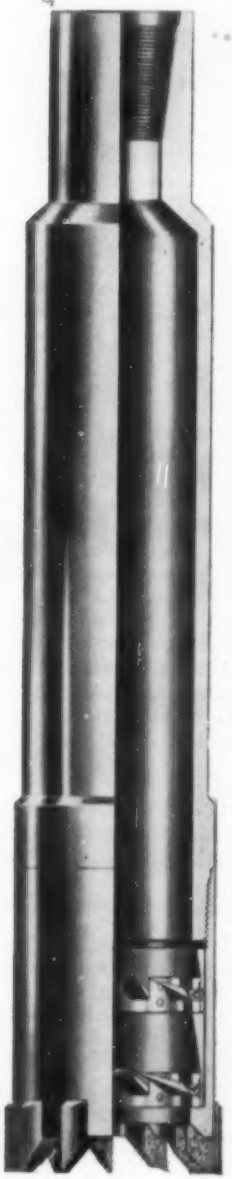
Dear Sir:

I enjoyed very much your fine article on the oil business in the great state of Texas (May 24th issue). However, you mentioned a piece of misinformation about the Shell Transport & Trading Co. that I think we should correct before it becames a part of established legend.

This is that the Shell Transport & Trading Co. was not in the oil business prior to Spindletop . . . The facts are that Spindletop came nearer to being the undoing of the Shell company rather than its start.

The Shell Transport & Trading Co.'s business grew very rapidly once it had been started, and by 1900—a year be-

...don't get away from the **GLOBE**



Fishing in an oil well is no fun. It's a tough job . . . and, one that ***must be done fast!***

Globe Junk Catchers are familiar friends to the oil industry, everywhere. They have performed fast and profitably, making complete recoveries of everything from snarled wire rope and small broken pieces of junk to complete pilot bits.

The Globe is an emergency tool that never fails! . . . available with either dog type or magnet type catchers.

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OIL TOOLS COMPANY

main office and plant:
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Branches in All Principal Fields. Refer to Your Classified Telephone Directory for the Branch Nearest You.

OPERATION BEST SILENCING!

Special Orders:

BURGESS-MANNING Exhaust and Intake

Snubbers installed for Tennessee

Gas Transmission Company

...engineered for this service.
...built to meet specific requirements.

OVER 100 SNUBBERS

Below: Exhaust snubbers and combination air filter snubbers engineered and built for four 1,600 h.p. and eight 2,000 h.p. gas engines at Station #1, Agua Dulce, Texas.

Above: Seven exhaust snubbers and seven combination air filter snubbers designed to meet the silencing requirements of seven 2,000 h.p. gas engines at Station #9, Bloomington, Texas.

Proper silencing is one of the keynotes of efficiency. That is the reason Tennessee Gas Transmission Company, operator of one of the major trunk line systems in the country, consulted Burgess-Manning Sound Engineers on their silencing requirements. Over one hundred snubbers were engineered and constructed by Burgess-Manning to eliminate the intake and exhaust noises at compressor stations along the Tennessee line.

For engineering data on your problem of noise control, call a Burgess-Manning Sound Engineer.

BURGESS-MANNING COMPANY

1203 DRAGON STREET
DALLAS, TEXAS

Sound Engineering

LIBERTYVILLE, ILL.
CHICAGO, ILL.

fore Spindletop—the company had 30 ocean-going tankers, 31 ocean terminals, 320 depots throughout India, the East Indies, Japan, and the China Coast, had a contract for the production of the Moera Enim oil field in South Sumatra, owned the Sanga Sanga field in East Borneo, and a substantial refinery at Balik Papan. Shell Transport & Trading was at this time no doubt the largest single oil company outside the Standard group.

In addition to its Far Eastern marketing, Shell did considerable business in Western Europe, and it was to enlarge its European markets that the company made a long-term contract with the Guffey people. Four large new ocean tankers were built to carry this oil across the Atlantic, and contracts for its future delivery were arranged . . . Then almost overnight, Spindletop petered out, leaving Shell holding the bag, its four new tankers unemployed and its commitments to customers impossible of fulfillment except at greatly increased costs. . .

H. L. Curtis
Assistant to the President
Shell Oil Co.

Congress Could Help

". . . The emergence of Canada as a potential large-scale exporter of crude oil to the U. S.; the almost complete loss of domestic oil producers' export markets; the ever-increasing volume of crude oil entering this country from Venezuela and the Middle East; the quickening volume of U. S. importation of Mexican crude oil; the aforementioned statements of future intentions by heads of importing oil companies; the campaign by the Creole Petroleum Corp. in behalf of added oil imports.

"These, and many other signposts indicate the trouble that lies ahead for the domestic oil producing industry unless it is assured a ratio of domestic peacetime markets somewhat comparable to the certain demands on the industry in time of war.

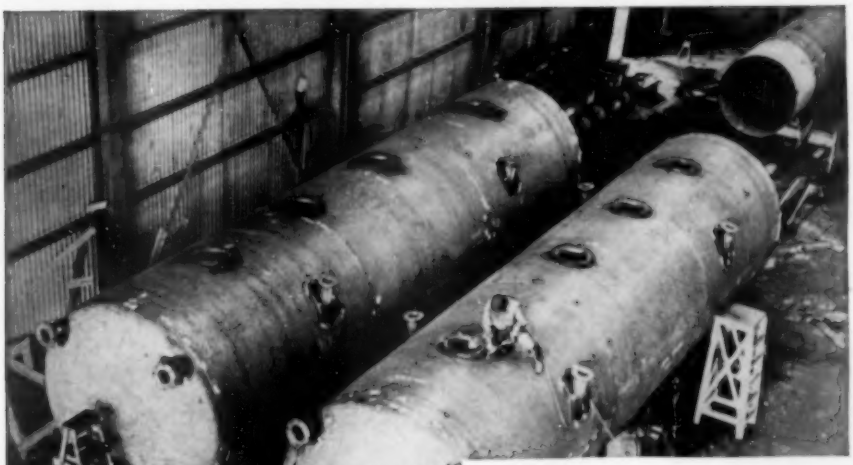
"Congress can provide that assurance . . ."

John Jarman, United States Representative from Oklahoma, in a speech before the House of Representatives.

Court's Decision Unsound

"We believe, along with many other spokesmen for the petroleum industry, that the results of the Supreme Court's decision in the Phillips case are basically unsound in principle and contrary to the best interests of both natural-gas producers and natural-gas consumers.

"Prompt action by Congress is called for to make it clear that gathering and production and sales of natural gas by



A Mile of Shops – Each shop is devoted to a special type of heavy production. Included are complete Machine Shops, casting, forging and other facilities which offer all of the advantages of the execution of the complete job.

A half mile of pressure vessels

These are two of seventy – over ½ mile – of 38½-foot vacuum tank casings built to meet the quality requirements of a well-known processor.

The buyer also benefits from many savings made possible by Newport News extensive heavy fabrication equipment and the sixty years experience in using it.

Do you plan installations of heavy production equipment? You can command the services of Newport News for weldments of corrosion-resistant, alloy and clad metals in almost any size or shape, plus the required engineering background and complete welding and stress-relieving skills.

It will pay you to get the facts, shown in *Facilities and Products.* As you glance at its photos and brief captions, you'll see why Newport News can turn out – at low cost – specialized heavy equipment for process plants.

Send for *Facilities and Products* – free – today.

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producers is not subject to the terms of the Natural Gas Act."

L. F. McCollum, president of Continental Oil Co., in a statement made following the Phillips case ruling.

Need Voluntary Importation

"With half of the world under domination of the Supreme Soviet and while we watch the skies for signs of the next world war, the wildcatter, whether major or independent, must not be discouraged.

"... To keep the industry healthy in peace and adequate in case of war, we feel that imports must flow to us under sane regulation, voluntary in the initial instance and away from federal control until abuse ultimately brings such upon us..."

Doxie Moore, first vice chairman of Interstate Oil Compact Commission, in an address at a Savannah, Ga., I.O.C.C. meeting.

Wants Iranian Control

"... We must have full control of the oil installations. This is our property and we have a right to supervise control of it. We must let foreigners know that if they do not solve the oil problem justly we shall complain to the United Nations."

Arselan Khalatbari, member of Iran's parliament, in a speech before the parliament.

Natural Gas, Not Imports

"It is apparent to us that the principal reason for the failure of U. S. crude oil to find larger markets is not increasing imports. The primary reason is increasing competition from natural gas and liquids therefrom...

"Until such time as field prices for gas have come into closer balance with real values paid to producers of crude oil, property and royalty owners can continue to expect meager returns and crude oil will suffer still further inroads in its markets."

T. S. Petersen, president of Standard Oil Co. (Calif.), in a letter to E. O. Thompson, chairman of the Texas Railroad Commission.

The Hard Facts

"The hard economic facts of excess supplies of crude oil and excess refinery runs are impressing themselves on petroleum management generally, and I believe you will see our industry follow the example already set by other industries in halting the increase in stocks and in liquidating any excesses in an orderly manner."

P. C. Spencer, president of Sinclair

Your choice of COLOR

IN HARD BOILED* Safety Hats

STRONGER-THAN-STEEL FIBERGLAS crowns offer unlimited choice of vivid, permanent colors... with color molded all the way thru the safest crowns ever built. Shock-resisting ribbed design also available in aircraft grade aluminum.

Write for Full Color Circular

SAVE MONEY . save time! One size fits all heads . . reduces inventories. Fully adjustable headband and hammock; can be changed in six seconds. Self-shaping and air-cushioned for comfort.

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275 EIGHTH STREET, SAN FRANCISCO, CALIFORNIA

GREATER SAFETY FOR MEN WHO PREFER METAL HEAD PROTECTION

BULLARD ALUMINUM SAFETY CAPS & HATS

Famous Bullard shock-absorbing, safety, ribbed crown design now available in rugged aircraft grade aluminum Caps and Hats • Light, strong, comfortable • Exceed 40 pound drop test for resistance • Satin, permanent, no-glare finish • Exclusive Bullard hammock-headband assures proper fit, ample head space and air circulation. Standard winter liners and chin straps fit all models.

"SHORTY" CAP

Visor protects the face. Flared brim keeps ears and neck safe from falling objects. No wide brim to interfere with carrying or working in close quarters. Weighs only 10 ounces.

"ROUGH-NECK" HAT

Weighs only 12 ounces. One type headband fits every head. Can be adjusted in 6 seconds to any standard size. New hat cleanliness and comfort restored in minutes with interchangeable headbands.

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DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

July ★ One of a Series of Interest to the Petroleum Industry ★ 1954

NEW WEST COAST TERMINAL FACILITIES

Beginning in August of this year, refiners in the northern Washington area will be able to receive tetraethyl lead shipments direct from the new Du Pont terminal which is being constructed near Ferndale.

The terminal will supply TEL either in railroad tank cars or tank trucks, both of which can quickly deliver the compound throughout this rapidly expanding refinery area.

New Movie to Help Your Dealers Handle Gasoline Complaints

The chances are that your *products* get the blame whenever a customer's car begins to act up. And your dealers are on the firing line whenever a customer complains.

The gasoline, however, is not always at fault when an engine knocks or fails to function properly. The trouble is often caused by such natural factors as low humidity or high temperature . . . by mechanical factors such as too lean a carburetor setting, an overadvanced spark, or a faulty water pump, thermostat, fan belt or other engine troubles that cause excessively high engine temperature. Poor driving habits also increase the tendency for knock to occur.

But your big problem is teaching dealers to explain these common causes of knock to customers in a salesmanlike way. To help you solve this problem, the Du Pont Petroleum Chemicals Division is now making a movie which explains simply and graphically the common cause of knock.

The Petroleum Laboratory's completely equipped chassis dynamometer is being used in the movie to show how various factors cause knock by their influence on combustion reactions.

The movie script and demonstrations are easy to understand and remember. It will be, therefore, suitable for showings to customer groups as well as for use in your dealer training program.

Production of the movie is not expected to be completed until later this year. Its availability will be announced at that time.

Spindletop Roars in Again for Multi-million TV Audience

Du Pont makes movie about this famous oil well for "Cavalcade of America" TV program

When she blew 'er top, the world went into high gear. That is how a schoolboy might describe the momentous occasion of January 10, 1901, when Spindletop gushed up and spattered her wooden derrick over the Texas landscape.

SPINDLETOP COMES IN with a roar of gushing oil that sends her derrick flying. It is a moment of triumph for Anthony Lucas and his wife Caroline, played in the film by William Bishop and Nancy Hale.

Photographs courtesy of General Petroleum Corporation, who rendered valuable assistance in filming "Spindletop."

The blowout of this fabulous well that tapped the tremendous petroleum resources of the Texas Gulf region is one of the epic moments in the history of our oil industry. Early this year, the scene was dramatically re-created and filmed for television so that millions of Americans can know the story as it happened.

Authentic Tools

Although filmed in California, the movie is authentic in mechanical and historical detail. To properly set the stage, old-time drilling tools were scouted out of rusting junk heaps on

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Spindletop*

leases all the way from Maricopa to Coalinga. Mariana No. 77 at the south end of Belridge field was chosen as the blowout site. In the final scene, the old wooden derrick that had stood for something like 30 years over Mariana No. 77 is completely and realistically destroyed by the terrific pressure of the blowout.

IN ORDER TO REACH the final depths of Spindletop, Captain Lucas designed this special steam valve equipment.

Network Telecast

The "Spindletop" film was specially made by Du Pont for showing on the "Cavalcade of America" television program on May 11. This program is seen by an average weekly audience of 12.5 million viewers. The theme of the movie is one that tells a powerfully dramatic and convincing story of the rugged pioneering spirit typical of the American Oil Industry. As such, this first showing had considerable public relations value for the whole industry.

Captain Lucas' Struggle

Like all "Cavalcade" programs, the "Spindletop" story revolves around an individual who has carved a place in

OIL DRILLING equipment, typical of the times, is used in the staging of the movie.

our country's history through outstanding accomplishment . . . in this case, Captain Anthony Lucas.

The setbacks and heartbreaks of wildcatting—as well as the drama, the excitement, and the thrill of success—are accurately portrayed in the film . . . as seen through the struggle of Captain Lucas to push through to success a venture he believed in.

Available to you

Prints of the "Spindletop" film are now available to your company for use in your own public relations program. Address your request to any of the Du Pont Petroleum Chemicals Division regional offices listed below.

SALES PROMOTION MANAGER

R. Carter W. Jones was recently named Sales Promotion Manager of the Du Pont Petroleum Chemicals Division.

A graduate of the University of Virginia with a B. S. degree in chemistry, Mr. Jones joined the Du Pont Company in 1936 as a chemist at the Jackson Laboratory. In 1939 he was made manager of the Du Pont Tetraethyl Lead Laboratory.

He then became a sales correspondent for chemical intermediates. And from 1941 to 1946 he was engaged in research work at the Du Pont Petroleum Laboratory. After this, he was assigned to the Technical Section of the Petroleum Chemicals Division. Mr. Jones transferred to the Division's Sales Promotion group in 1950.

R. CARTER W. JONES

Regional Laboratories Offer Aid to Refiners on Antioxidant Sweetening Problems

TOM BINFORD, Supervisor of the Du Pont Petroleum Chemicals Division West Coast Regional Laboratory, calibrates the air regulator during a plant antioxidant sweetening trial at a West Coast refinery.

To be practical, results of laboratory antioxidant sweetening trials — even when run with your own refinery stocks — have to be adapted to plant practice.

During the past years, our five Regional Laboratories have gained considerable experience in this work. As a result, we can offer you valuable assistance in setting up and operating an antioxidant sweetening process.

A Du Pont representative will be glad to consult with your own personnel right at the refinery on equipment selection and installation. And during a plant antioxidant sweetening trial, he will help in the testing for antioxidant and mercaptan content, on sampling of refinery stocks, and in checking antioxidant and air addition equipment.

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CHICAGO, ILL.—8 So. Michigan Blvd. Phone RAndolph 6-8630
TULSA, OKLA.—1811 So. Baltimore Avenue Phone Tulsa 5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. Phone PRestan 2857
LOS ANGELES, CALIF.—612 So. Flower St. Phone MAdison 5-1691
IN CANADA: Du Pont Company of Canada Limited—Toronto, Ont.—Montreal, Que.—Calgary, Alta.
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Bldg., 6539—Wilmington 98, Del.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-7551

Printed in U. S. A.

Oil Corp., in an address in New York before the New York Society of Security Analysts.

A Company's Obligation

"The entire history and development of our country has been based squarely on a system of individual initiative and freedom of enterprise and accomplishment. It makes sense, then, that our company—that every corporation in our land—has not only the responsibility, but the duty of helping to encourage and strengthen those principles which have made this nation great.

"We have an obligation to develop understanding for the system of corporate enterprise which our company represents. We must remember that in many parts of this world, a company like United Gas cannot even exist, much less earn money for its stockholders."

N. C. McGowen, president of United Gas Corp., at the annual stockholders meeting in Shreveport.

What Employes Want

"Many research studies have been made of the things employes of businesses want, and the results are very interesting. High wages do not stand at the top of the list, as many might think.

"Preceding financial rewards are such things as: recognition of the employe as an individual and not as a cog in a machine; opportunity for advancement and self-betterment; a feeling of participation and contribution in the company's affairs; a sense of belonging to an organization that is contributing in a worthwhile way to our economy and society.

"Next after these comes the desire for steady employment and job permanency; and following close behind come benefit plans such as pensions, savings plans, and sickness benefits. Then come salaries and wages, and further down the line are such things as working conditions, safety, and a number of miscellaneous factors."

M. J. Rathbone, president of Standard Oil Co. (N.J.), in the commencement address at Lehigh University, Bethlehem, Pa.

Meet the Attack

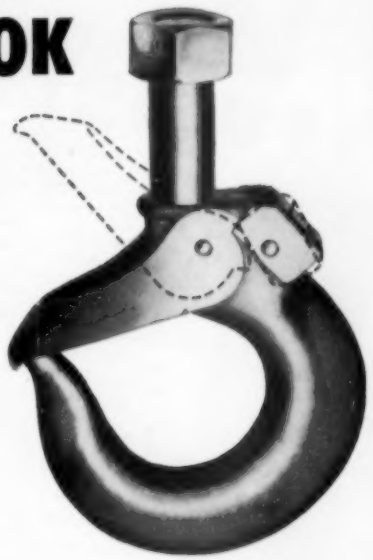
"... Some politicians, intellectuals, and labor leaders have been hammering at the rank and file of Americans for decades, pounding home the idea that the two best friends the average man has are the Government and the labor unions. At the same time, they stigmatized the industry as selfish, predatory, and basically anti-social. While this was going on, industry until recent years did little or nothing to meet the attack."

William H. Ward, vice president of

Look at the Safety and Convenience Features in

COFFING'S NEW

SAFETY HOOK



You are invited to compare this new Coffing Safety Hook, and see for yourself its many advantages — in safety to men and equipment, in convenience and ease of use.

POSITIVE LOCK under spring tension securely holds the latch in place.

NO SIDEWAYS MOVEMENT POSSIBLE, because latch fits snugly over point of hook.

HIGHER TENSILE STRENGTH than any other hook of its size. Has drop-forged, heat-treated alloy steel construction.

NO RUSTING OR CORROSION to hinder use, because the hook is cadmium plated.

EASILY RELEASED — HELD OPEN — Slight pressure on the release unlocks the latch Spring tension on the release also holds the latch open.

LARGE THROAT OPENING allows full and unobstructed use of entire area inside the hook

AVAILABLE FOR BOTH NEW AND OLD COFFING HOISTS

The Safety Hook is available on new Coffing Hoists you order, and you can also place it on Coffing Hoists already in service . . .

Send today for literature just published telling all about the outstanding new Coffing Safety Hook — just ask for Bulletin F7SH.

SAFETY-PULL RATCHET LEVER HOISTS

Models RG and RTG Coil Chain | Models AG and ATG Roller Chain

CHALLENGER SPUR-GEAR HOISTS

½- and 1-ton models

COFFING HOIST COMPANY

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Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Spur-Gear Hoists
Differential Chain Hoists • Load Binders • I-Beam Trolleys

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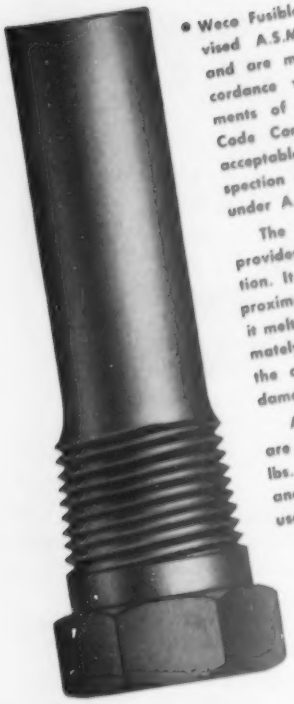
BOILER SAFETY!

WECO

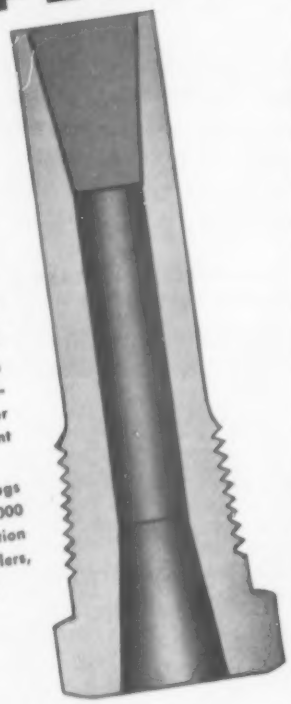
FUSIBLE PLUGS



• Weco Fusible Plugs meet revised A.S.M.E. requirements and are made in strict accordance with the requirements of the Power Boiler Code Committee. They are acceptable to all Boiler Inspection Authorities working under A.S.M.E. codes.

The ¾"x4" Fusible Plug provides additional protection. It will melt out at approximately 450 deg. F. When it melts-out it leaves approximately 9/16" of water over the crown sheet to prevent damage.

All Weco Fusible Plugs are kerosene tested to 1000 lbs. pressure. For protection and safety of your boilers, use Weco Fusible Plugs.



CONVENIENTLY PACKAGED

WECO Fusible Plugs are now packaged in corrugated cartons, clearly labeled to show size, description and quantity.

WECO FUSIBLE PLUGS

SIZE	NO.	WEIGHT
½" x 2¼"	1093	5 oz.
½" x 2¾"	1087	6 oz.
½" x 3½"	1081	8 oz.
¾" x 2¼"	1091	8 oz.
¾" x 3"	1085	10 oz.
¾" x 3" Lg. Thd.*	1097	10 oz.
¾" x 4"	1079	12 oz.
¾" x 4" Lg. Thd.*	1095	12 oz.
1" x 2-5/16"	1089	12 oz.
1" x 3"	1083	13 oz.
1" x 4"	1077	16 oz.

*1¾" Thread length

PESA

It's wise to standardize with.. WECO

WECO

WELL EQUIPMENT MFG. CORP. • Division of Chiksan Company • HOUSTON 1, TEXAS

E. I. du Pont de Nemours & Co., in an address before the members' council of the New Orleans Chamber of Commerce.

CALENDAR

JULY

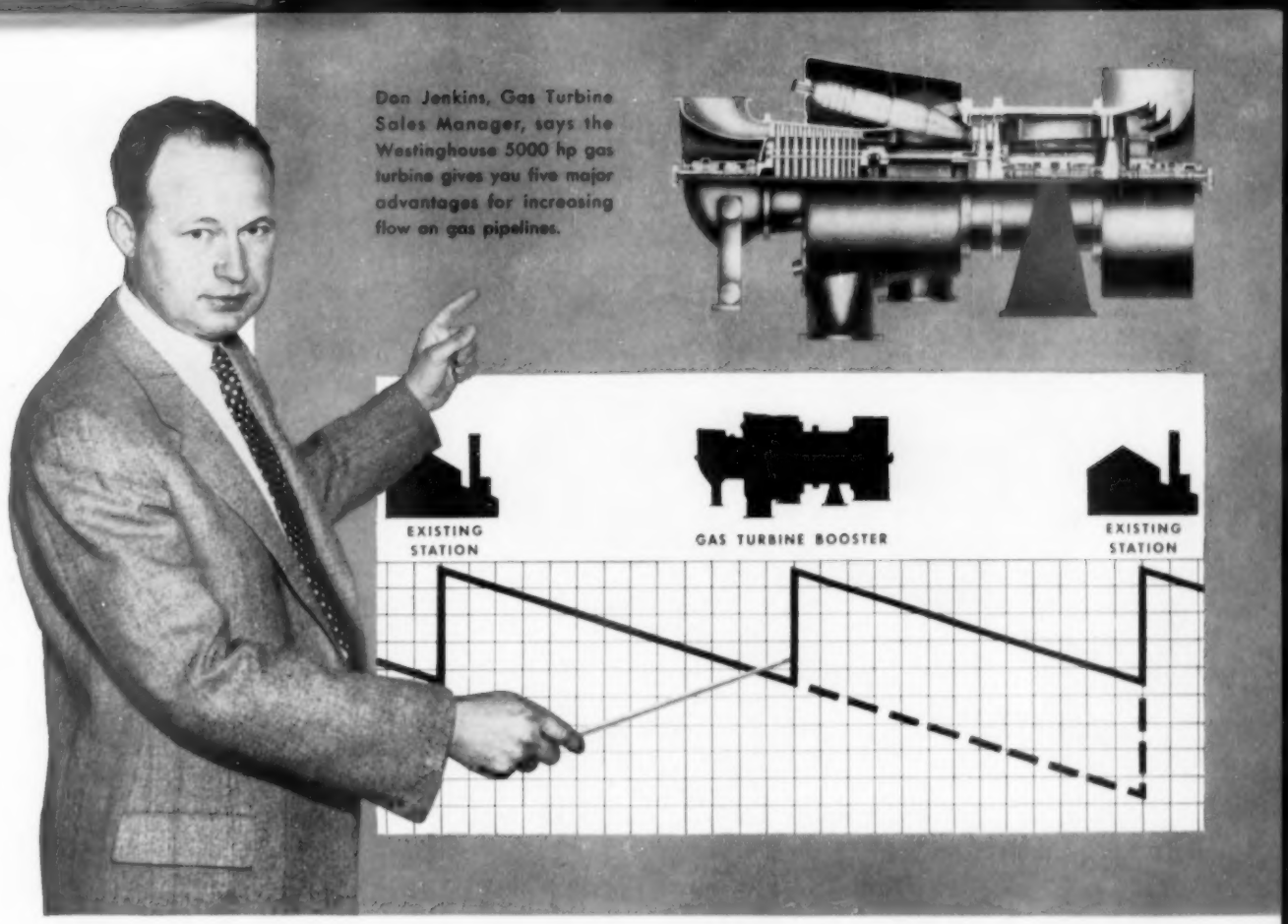
13-14 Western Plant Maintenance Conference, Ambassador Hotel, Los Angeles.
15 Southern Gas Association, conference on radio communications for pipelines, Adolphus Hotel, Dallas.
16 Southern Gas Association, dispatchers' conference, Adolphus Hotel, Dallas.
29-31 Wyoming Geological Association, ninth annual field conference, Townsend Hotel, Casper.

AUGUST

13 Southern Gas Association, pipeline operations and engineering conference, Rice Hotel, Houston.
16-18 Society of Automotive Engineers, West Coast annual meeting, Statler Hotel, Los Angeles.
20 Southern Gas Association, conferences on natural-gas gathering and natural-gas processing, Captain Shreve Hotel, Shreveport.
23-25 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.
26-28 (tentative) Intermountain Association of Petroleum Geologists, fifth annual field conference, beginning at Price, Utah.
27-28 Joint meeting, reserves committees of A.G.A., A.P.I., Canadian Petroleum Association, Banff, Canada.

SEPTEMBER

7-9 Association of Desk and Derrick Clubs of North America, annual convention, Banff Springs Hotel, Banff, Alta.
8-10 Pacific Coast Gas Association, sixty-first annual meeting, Vancouver Hotel, Vancouver, B. C.
9-11 Interstate Oil Compact Commission, Omaha, Neb.
10 Southern Gas Association, conference on compressor-station operation, Jung Hotel, New Orleans.
12-16 American Institute of Chemical Engineers, Colorado Hotel, Glenwood Springs, Colo.
13-14 Independent Natural Gas Association of America, annual meeting, Roosevelt Hotel, New Orleans.
15-17 National Petroleum Association, fifty-second annual meeting, Traymore Hotel, Atlantic City, N. J.
16-17 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.
23-24 Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper, Wyo.
27-28 Symposium on Methods for Testing Liquefied Petroleum Gases (ASTM D-2; ASTM D-3, CNGA & NGAA), Statler Hotel, St. Louis.
27-29 Electrical Conference for Petroleum Industry, American Institute of Electrical Engineers, Mayo Hotel, Tulsa.
27-30 Ninth Annual Petroleum Mechanical Engineering Conference, petroleum division of the American Society of Mechanical Engineers, Statler Hotel, Los Angeles.
28-29 Texas Mid-Continent Oil and Gas Association, Baker Hotel, Dallas, Tex.


Don Jenkins, Gas Turbine Sales Manager, says the Westinghouse 5000 hp gas turbine gives you five major advantages for increasing flow on gas pipelines.
EXISTING STATION
GAS TURBINE BOOSTER
EXISTING STATION

WESTINGHOUSE GAS TURBINE BOOSTER STATIONS . . .

Put *all* of your pipeline to work!

Westinghouse Gas Turbines now make it more *practical* than ever before to add boosters wherever you need them—and do it at *less cost* than other types of drives. Here's why:

- **Lowest installation costs:** Smaller building and lighter foundation than any other drive in widespread use.
- **Lowest operating costs:** A typical two-unit station requires only two men per shift. The simple, clean design has extremely few moving parts—easy to operate, inexpensive to maintain.
- **Extra power:** Up to 25% during cold peak-demand periods . . . more than any other type of drive.
- **No cooling water:** An outstanding advantage of Westinghouse Gas Turbines.
- **Direct connection to centrifugals:** The gas turbine is the *only* drive, using gas directly from the line, that drives centrifugal compressors without step-up gearing . . . an important advantage where the high-flow, low-compression ratio of centrifugals is needed.

Westinghouse Gas Turbines have many more inherent advantages for gas pipeline service. Your Westinghouse Salesman has the full story for you now, in terms of proved performance and sound economics. Call him or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-50568

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Simplest Way

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DURABILITY?

APPEARANCE?

HEAT RESISTANCE?

FUME RESISTANCE?

HEAT REFLECTION?

CORROSION RESISTANCE?

Special painting problems take specialized paints to solve them. Whether your needs are for unusual resistance to chemicals . . . moisture . . . exposure . . . other special requirements . . . there's one simple way to find sound, up-to-date recommendations based on continuing research and broad petroleum industry experience.

That way is to call on Sherwin-Williams. Latest recommendations covering all types of petroleum applications are contained in Brochure No. B-770. Write for your copy. The Sherwin-Williams Co., Petroleum Division, Cleveland 1, Ohio.

SHERWIN-WILLIAMS

PETROLEUM FINISHES

COVER THE EARTH

30 Southern Gas Assoication, conference on transmission management, Shamrock Hotel, Houston.

OCTOBER

1 Southern Gas Association, conference on gas pipeline rights-of-way, Rice Hotel, Houston.

3-7 ASTM Committee D-2 on Petroleum Products and Lubricants, Sheraton Park Hotel, Washington, D. C.

4-6 Texas Mid-Continent Oil and Gas Association, annual meeting, Plaza Hotel, San Antonio, Tex.

4-6 Petroleum Electric Power Association, twenty-sixth anniversary meeting, Jung Hotel, New Orleans.

6-8 Eighteenth Technical Conference on Petroleum Production, Pennsylvania State University, State College, Pa.

7-8 California Natural Gasoline Association, twenty-ninth annual fall meeting Ambassador Hotel, Los Angeles.

7-8 American Institute of Mining and Mettallurgical Engineers, Pacific Petroleum chapter, fall meeting, Biltmore Hotel, Los Angeles.

10-13 American Association of Oilwell Drilling Contractors, fourteenth annual meeting, Biltmore Hotel, Los Angeles.

11-13 American Gas Association, annual convention, Atlantic City, N. J.

12-15 Eighth National Chemical Exposition, Chicago Coliseum, Chicago.

14-17 Permian Basin Oil Show, Odessa, Tex.

17-20 American Institute of Mining and Metallurgical Engineers, petroleum division, fall meeting, Plaza Hotel, San Antonio.

21-22 Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.

24-26 Independent Petroleum Association of America, annual membership meeting. Mayo Hotel, Tulsa.

25-27 National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco.

26-28 Society of Automotive Engineers, national diesel engine meeting, Statler Hotel, Cleveland.

NOVEMBER

1-3 Geological Society of America, annual meeting, Statler Hotel, Los Angeles.

3-5 Gulf Coast Association of Geological Societies, fourth annual meeting, Rice Hotel, Houston.

4-5 Society of Automotive Engineers, national fuels and lubricants meeting. Mayo Hotel, Tulsa.

5 Southern Gas Association, conference on field production of natural gas, Herring Hotel, Amarillo.

8-11 American Petroleum Institute, thirty-fourth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

11-12 American Association of Petroleum Geologists, Pacific section annual meeting, Biltmore Hotel, Los Angeles.

17-18 North Texas Section, American Institute of Mining and Metallurgical Engineers, and Production Committee of the North Texas Oil and Gas Association, symposium on secondary recovery, Wichita Falls, Tex.

28-Dec. 3 American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4 Interstate Oil Compact Commission, winter meeting, Drake Hotel, Chicago

2-4 American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.

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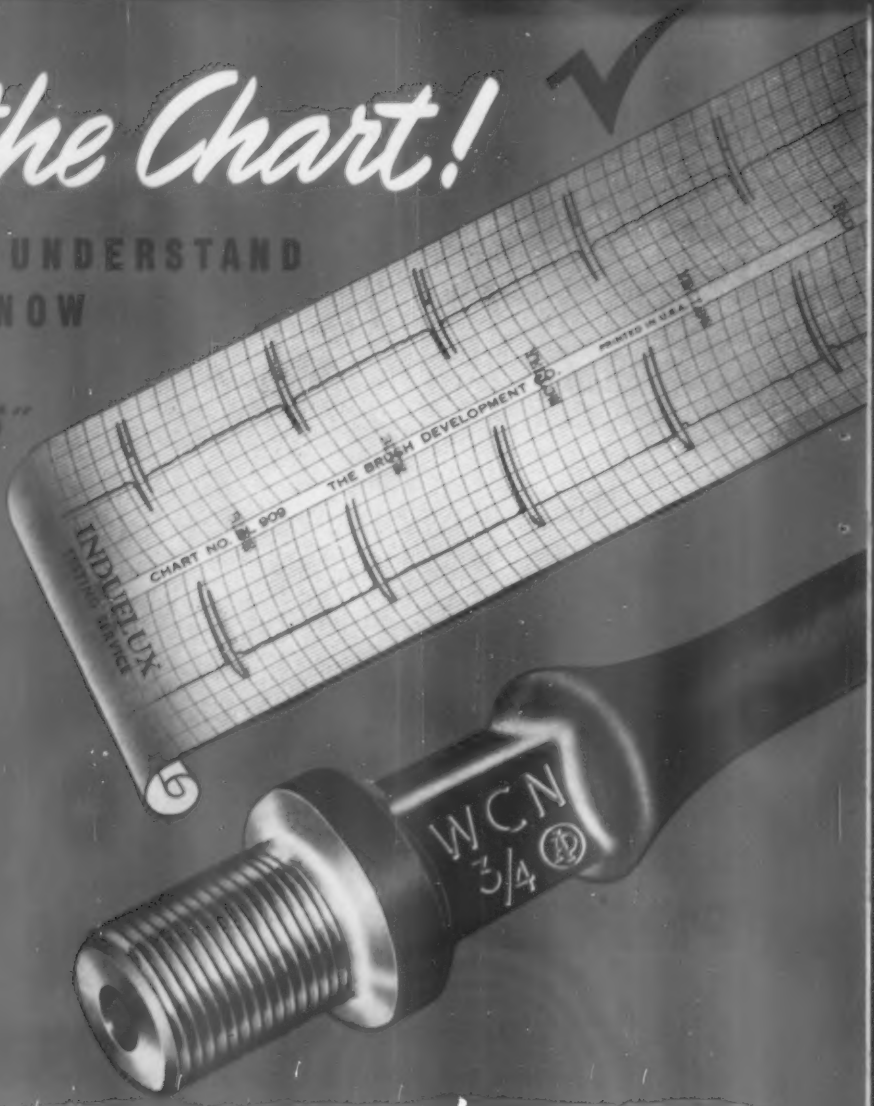

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THE OIL AND GAS

JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY Speaking

Cancerous Geologists

SOME wildcatters, it has been suggested, seem to get their ideas from smoking opium, and here's a gent who says you can't find oil by smoking cigarets and he hopes all geologists die of lung cancer.

He wants no truck with modern scientific methods of oil finding—thinks the specialists and service companies are barnacles and parasites. He got so worked up over the subject that he unburdened himself to us thusly:

"The geology of oil has become so critical that the geologists etc. claim to be able to tell where oil will be found not by miles, not by yards, but by feet. It's all bosh. The big idea is to make money off of the operator. The operator is usually the pioneer type. He takes a chance. He believes that nature did not cut things as fine as the geologist and geophysicists claim they can cut it. There is much more money spent in the damn laboratories and what have you than on the derrick floor, which is heresy of the most flagrant type.

"As a result, the cost of drilling wells is up and up, and who profits by it? Surely not the operator, with his pioneer character. The well is surrounded day and night by trucks, electrical contrivances, geologists, paleontologists, heaven knows what not—what a motley crew. No one puts up a dime except the operator.

"Great fields were found long before these scientists cut the deal so fine that no one understands what it is all about. Great bodies of oil and gas are in the ground not discovered but they will be discovered if the prospector gets rid of all these scientific barnacles. The bit tells the story, and that is the end of it.

"Instead of putting a halo around the scientists, erect a monument to Dad Joiner, the great wildcatter who did not know enough to know that he did not know anything.

"A bride needs a cookbook. Your dear old mother cooked by feel and experience. She did not have scientific heat regulators and a million gadgets. A good farmer feels the climate and the soil, and he grows good crops. He does not need these young scientists who do nothing except sit at desks and fill their ash trays with cigarets—which I hope gives them cancer."

There now, you young scientists, take that! Snuff out that fag and start feeling for oil.

In a way, though, we sympathize with this befuddled fellow. Exploration for oil is getting mightly complicated. And all the various 'ologists and their mysterious gadgetry do increase the cost. Perhaps there is some danger that some of the "young scientists" may become so intrigued with the mechanics of "cutting things fine" that they might forget that what they are really after is oil.

But we're on the side of the scientists, cigarets or no. After all is said and done, they have helped tremendously in finding oil. However, it still takes a good deal of Dad Joiner's dogged faith and the traditional wildcatter's playing of hunches to find oil. Only today the wildcatter has to be smart enough to interpret the reports from the technicians and decide which ones to believe and which to disregard.

Notes From All Over

MID-CONTINENT PETROLEUM CO. employs a full-time chaplain . . . a former refinery worker, now an ordained minister . . . does about what an Army chaplain does. Desk and Derrick girls all over the country made things hot for the editors of a national woman's magazine for printing a story overglamorizing a Texas oil secretary . . . vigorously protested they're not party girls, traveling companions, nor policy makers. The match industry has awarded Cities Service Oil Co. a bronze "Joshua Plaque" for the design of its matchbook covers . . . named for the man who invented book matches. A well in Texas produced a fish 1,000,000 years old . . . quite dead, but paleontologists prize it as one of the rarest fossils in the world.

—Henry D. Ralph.

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Here's a new idea for a tariff on oil

THERE will be no new legislation affecting oil imports this year, it is now obvious, but next spring Congress plans a thorough study of our entire foreign trade and tariff policy.

In preparation for this, the Independent Petroleum Association of America offers a new idea: Favor imports from countries which are heavy purchasers of United States merchandise, and penalize imports from countries which buy relatively little.

As a general principle, this idea has quite an appeal. By recognizing that those who would buy from us must sell to us, it goes far toward meeting the arguments for free trade and yet it affords a measure of protection for domestic industries. It is a new approach to the problem of a flexible tariff.

THE FIRST FLEXIBLE TARIFF, back in the 1920's, attempted to adjust duties to equalize costs of production here and abroad. It was unsatisfactory because the exact cost of producing almost anything is an elusive and controversial figure, and politics often influenced the accounting methods of the Tariff Commission and the White House.

Then came reciprocal tariff bargaining, with the executive department negotiating cuts in our duties in exchange for concessions by specific foreign nations. This is meeting increasing criticism, and Congress extended it one more year only because of the promised restudy.

Now, says I.P.A.A., let's apply the principle of "trade, not aid" in our foreign policy. Buy from those who buy from us. On its face, that sounds like good sense.

THE BIG QUESTION is whether this principle can be embodied into a simple and practical formula which will be reasonably applicable and equitable to most countries and most commodities. If it can be shown to have general application, the I.P.A.A. plan will have a much better chance of acceptance than if it is open to a charge that it is a special gimmick rigged up for oil alone.

Perhaps a somewhat different standard for determining country quotas of low-duty imports would have a more equitable over-all application than the specific formula suggested by the I.P.A.A., but criticism of the particular tool to be used should not obscure fair consideration of the merits of the basic idea.

Further study may reveal serious flaws in the I.P.A.A. proposal, either for general application or specifically with regard to international petroleum trade. But it is a new approach to the tariff problem, offered in good faith after long deliberation. As such it deserves serious and objective consideration by the oil industry and by Congress.

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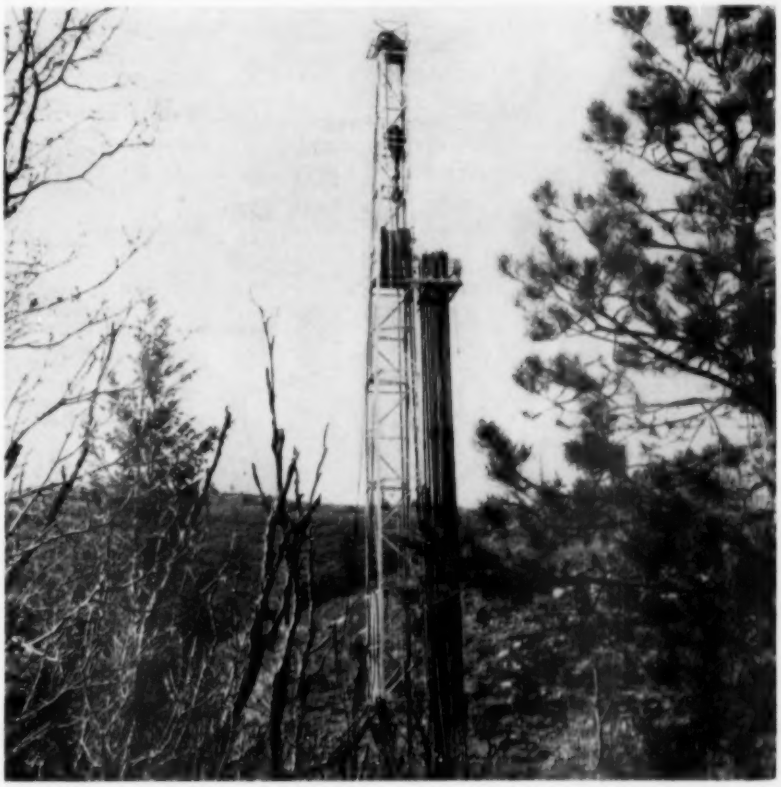
THIS WEEK . . . . . IN THE NEWS

CANADA—After 7 years of boom and wild optimism, Canada enters period of calm organized appraisal of her oil and points toward orderly development. . . . Canadians take a realistic look at their prospects, disadvantages and advantages. . . . Country chalks up progress in efforts to become self-sufficient in oil production, but realize geographical obstacles. . . . ¶Alberta government plans first sale of drilling reservations on crown reserve lands this week under new regulations. . . . Bidders will be required to drill tracts to specified depths within a year. . . .

PIPELINES—American Pipe Line official says construction on big products line from Beaumont to Newark will start by August 1. . . . Financing huddle held in New York. . . . Office of Defense Mobilization grants line accelerated tax writeoff due to defense aspects. . . . ¶Trans Canada wins tentative approval. . . . More data must be submitted before final OK. . . . Construction launched on Niagara Falls-Toronto spur. . . . ¶Westcoast Transmission vice president silent on his firm's plans to move gas into northwestern Canada. . . . Canadian gas executives think Westcoast's appeal of FPC ruling will delay Pacific Northwest on San Juan-Washington line. . . . ¶Union Oil plans several crude and products lines from Los Angeles and Oleum refineries. . . .



THIS RIG JUTS FROM THE RUGGED TERRAIN of northeastern New Mexico as it drills the area's first wildcat in 35 years. Continental Oil Co. is conducting the test, which is located in Colfax County. The site is 7,500 ft. above sea level and in narrow Cottonwood Canyon. The well is at about 4,000 ft. with a target depth of 8,500 ft. The rig is one of three Conoco is operating in the Raton basin.

REFINING—Tide Water awards engineering contract on 100,000-bbl. East Coast refinery. . . . Location of new plant still not selected. . . . ¶Wainwright Producers & Refiners, Ltd., lets contract for expanding Wainwright, Alta., refinery from 800 to 3,800 bbl. daily. . . . ¶Ten large refining companies charged in Texas with antitrust violations due to wholesale gasoline price hikes in 1946 and 1947 appeal case to state's Supreme Court. . . .

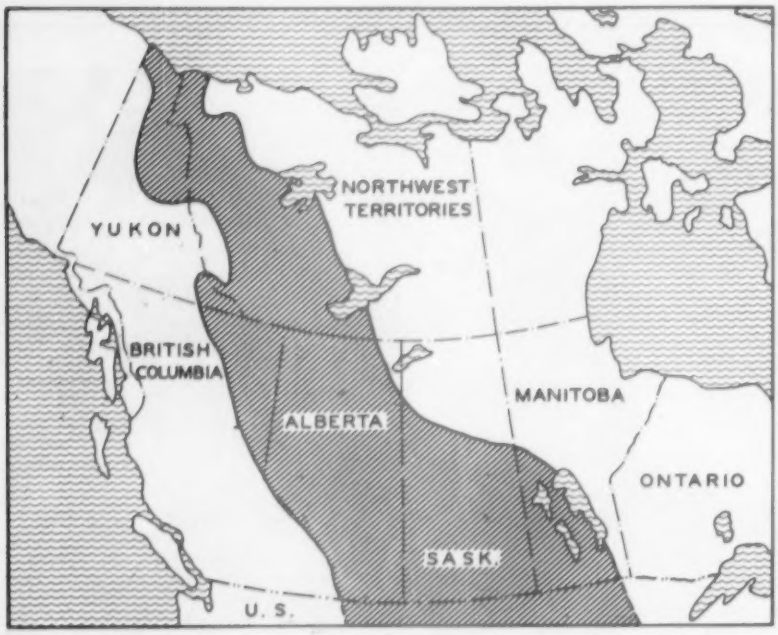
GOVERNMENT—President has coal vs. gas battle dropped into his lap as delegation visits White House urging economic props for ailing coal industry. . . . ¶Malone committee report urges making Western Hemisphere self-sufficient in critical materials needed for defense. . . . ¶Legislation to require 50 per cent of all cargoes bought with public funds be carried in American shipping draws fire from administration. . . . ¶Senate shouts down amendments to general tax bill threatening oil industry's depletion allowance. . . . ¶Congress votes $250,000 for Oil and Gas Division operations in current fiscal year. . . .

IMPORTS—New formula to assess higher duties on imports of oil in excess of certain quotas is proposed by I.P.A.A. . . . Formula based on reciprocal trade would penalize oil imports in excess of U. S. exports. . . . Western Hemisphere would not be affected, but Middle East oil would carry added tariff lead. . . .

INTERNATIONAL—Esso Standard negotiates for concession on more than 4 million acres adjoining the firm's recent strike in southwestern France. . . . ¶Men and equipment begin moving into Egypt as Egyptian American plans to open exploration program. . . . ¶Iranian talks going smoothly. . . . Agreement in principle expected by mid-July.

PRODUCTION—Atlantic's high-pressure gas injection in Block 31 is proving highly successful. . . . Company estimates 52 per cent recovery of oil in place. . . . ¶Sharp decline of production in Saudi Arabia, Venezuela, and Kuwait causes drop in free-world production during April.

EXPLORATION—Humble begins 20-well drilling program on offshore gulf leases to evaluate sulfur deposits and gain subsurface data on piercement salt domes. . . . ¶Diving geologists on West Coast are studying ocean floor in dives as deep as 130 ft. . . . ¶Standard Oil of Texas makes first commercial discovery on Texas Continental Shelf since last year's federal tidelands decision. . . . ¶Shell opens new Gulf of Mexico field 4 miles off coast of St. Mary Parish, Louisiana. . . .



Canadian Oil Grows Up

Canada discarding wild optimism of typical oil country boom in favor of constructive planning for new industry

Frank J. Gardner

EDMONTON, Alta.—After 7 years of boom, bust, and bonanza, the oil industry of Canada has begun to embark upon a second cycle of calm, organized planning and development.

Like all new oil regions, the Canadian provinces have experienced an initial period of wild enthusiasm, growing pains, and speculative storms. But beginning in 1953, a new spirit of retrospection and poise began to appear. The "industrial revolution" that Leduc field engendered had begun to assume reality, and Canada realized the necessity for a mature approach to the problems of competition and constructive planning for the future of its growing oil industry.

For 25 years, gold had held sway as the country's leading mineral in product value. In 1953, it was surpassed by oil.

With the opening of 1954, a great surge of optimism swept through the ranks of oil as the largest field in the country promised a billion barrels more oil at Pembina. But it was (and is now) cautious optimism, tempered with a realization of difficult decisions to come. In 7 years, 1½ billion dollars has been absorbed into Canadian exploration, development, pipelines, refineries, and other plants. Capital investment stands at 1 million dollars per day. Oil production has recorded a 1,200 per cent increase in that time.

Financially, the return of revenue to investment participants has been a gross of 54 cents for every dollar invested. The net has of course been much less than that. But the proven assets, the revenue to be expected—$7 billion gross worth in reserves—represent an industrial potential that could propel the western provinces into a new era of economic development and in time accord them equal stature with eastern Canada in the commercial picture.

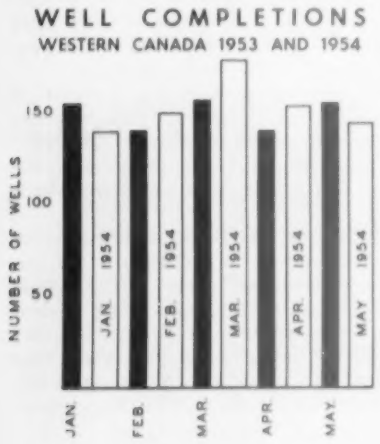
The background . . . What has been accomplished in the past 7 years? Figures tell the story, but figures don't paint the picture of change that oil has wrought. The charts on these pages show the pattern of growth, but they don't reveal the anticipation of Canada's future that is in the minds of her people.

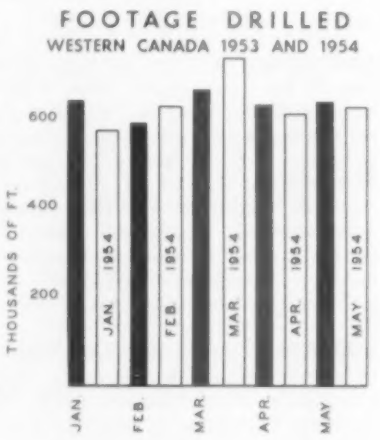
In 7 years, Canadian oil production has soared from 21,000 bbl. per day to 250,000 bbl. per day; pipeline mileage has increased from 400 miles to 4,000 miles; natural gas reserves have increased 1½ trillion cu. ft. per year; 24 operating oil companies have become 250; oil investments have grown from $1 million a month to $1 million a day; refining capacity has tripled; and crude reserves have increased 4,000 per cent.

That is the growth picture. It is the story of progress toward self-sufficiency for Canada, from 7.8 per cent in 1947 to nearly 50 per cent in 1954.

But, it is not the picture of what is to come. We must not anticipate a Canada overflowing with oil, seizing competitive markets, and challenging the status quo.

The present state . . . Canada has things to do at home. The self-sufficiency thus far attained is not balanced self-sufficiency. It is still an east-west country with oil production problems peculiar to an east-west economy. Canadians are trying desperately to set their domestic oil market in balance, and it is going to require some doing to lay down a barrel of Alberta oil in Montreal at a





price competitive with imported crudes arriving there today from Venezuela, the Middle East, and the Gulf of Mexico. If the country is to achieve 100 per cent self-sufficiency by 1958, as predicted in some quarters, then the problem of transport and east-west economics must be solved.

Briefly, the attitude of the industry in western Canada is one of hopeful anticipation for the future. There is confidence that important commercial and industrial development will take place, especially in the Plains provinces, that will achieve the needed balance and capitalize on both the advantages and disadvantages of geography, geology, and economics.

Advantages . . . On the positive side, geography and geology provide almost limitless room for growth. The area of favorable oil territory (see map) approximates 770,000 square miles, extending from the Rocky Moutnains to the pre-Cambrian shield and from the United States border to the Arctic Ocean. The density of drilling to date in this vast sweep of land is only 1 well to every 178 sq. miles (less than 5 per cent of the density in major U. S. oil regions).

Oil operations in the provinces may be carried on in an atmosphere of active government cooperation and encouragement, with a minimum of restriction and regulation; and it's a stable government, free from the threat of nationalization or expropriation. Geography provides a measure of security from hostile governments who might have other ideas.

Markets are broadening every day. Domestic demand is currently 492,000 bbl. per day, up about 10 per cent in the past year. Fuel demand is up, dieselization is on the increase (up 13 per cent), vehicles and tractors are multiplying (up 6 to 8 per cent), and imports are slowly decreasing.

Geology offers broad untested areas of favorable promise; multiple pay horizons add to the inducement to drill, and 183 million acres are being prospected by surface geological crews and geophysical parties.

Disadvantages . . . But, Canada has its hungry side, too. Much of its prospective oil land is discouragingly remote and lean in population. This leads to apprehension regarding transport costs and works against industrial market growth.

The price of crude at the well head is some 10 per cent lower than that in competitive U. S. fields; gas is ½ to ⅓ the price of U. S. gas and 1/6 that of Ontario-produced gas. Difficulty of access to U. S. markets adds to the problem of the producer, and half the Canadian market lies **east** of Toronto. In short, western Canada's ability to produce is growing faster than its markets are expanding.

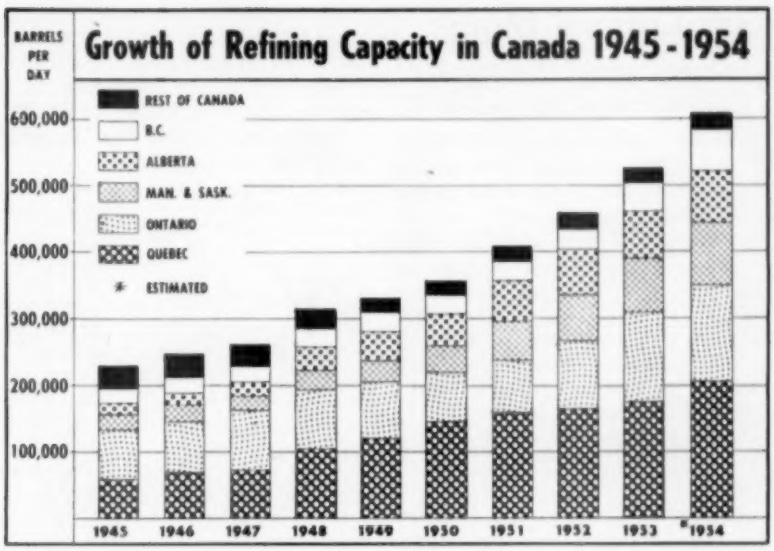


Chart by the Canadian Bank of Commerce

Gas is unemployed. For lack of sufficient outlets, and controversy over where and how it shall be utilized, it is indeed a "frozen asset" for the most part. But that problem will be solved, too. The recent denial of the U. S. Pacific Northwest markets was a disappointment, but new outlets will be found. Meanwhile, the construction of industrial stripping plants, chemical plants, and sulfur plants languishes. It is on its tremendous gas reserves (17½ trillion cu. ft.) that western Canada stakes its future as a billion-dollar industrial center. An outlet for its gas will also have a stimulating effect on drilling and development.

The future . . . Markets, exploration, and development loom large in Canada. Free enterprise and competition lend hope for an oil industry rivalling that of the U. S. in future years, but the immediate goal of all Canadians is self-sufficiency. Bigger markets and more transport are on the way; pipelines are being expanded and enlarged, refinery expansion continues, and Canadians hope to market 350,000 bbl. daily in 1955.

The outlook is for a strengthened economy, increased employment, new capital, and rich provincial treasuries. Since 1946, the Province of Alberta has received revenues equivalent to $800 per taxpaying citizen (more than $270 million) as rentals, bonuses, and royalties. There was even talk of paying dividends to citizens!

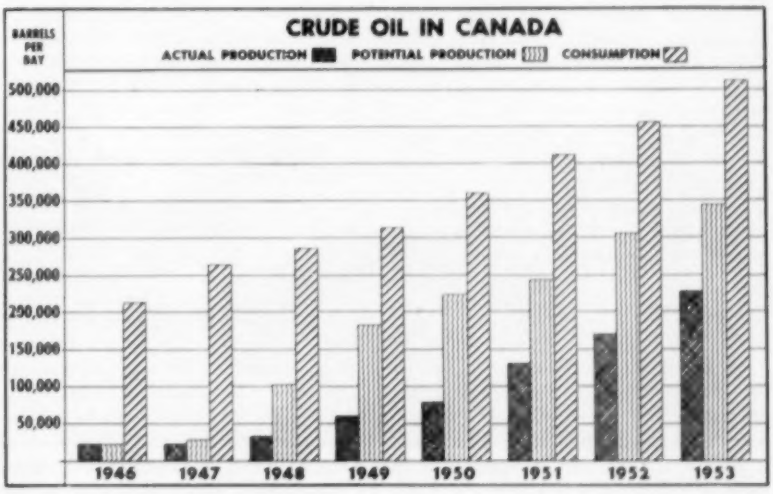


Chart by the Canadian Bank of Commerce

Gas Official Mum

Query about Westcoast's plans draws 'no comment'

BANFF, Alta.—Charles Hetherington, vice president of Westcoast Transmission Co., declined to comment here on when his firm will move natural gas into the Canadian northwest.

During a panel discussion at the annual meeting of the Canadian Gas Association, Hetherington was asked whether an appeal filed by Westcoast against the Federal Power Commission denying the company rights to build a line into the United States would delay plans to move gas into the power-short northwest area. He refused to comment.

Hetherington and several other gas company executives attending the session indicated the Westcoast appeal will delay Pacific Northwest Pipe Line Corp., Houston, several months in building a line from the San Juan basin to northern Washington. The FPC granted Pacific Northwest permission to build the San Juan-Washington line, but denied Westcoast permission to build a line into Washington from Canada's Peace River area *(The Oil and Gas Journal, June 28, page 84)*.

Hetherington charged Pacific Northwest does not have adequate gas reserves and will endanger the California supply if permitted to build the line.

Dr. O. J. Firestone, economic adviser of the department of trade and commerce, told the convention Canada's economy may double in size by 1975, adding that the natural-gas industry is expected to share in this growth.

Dr. Firestone said Canada's energy requirements are expected to increase 106 per cent by 1975, but said further studies are needed before it can be determined how much of this increase will go to the gas industry.

S. B. Severson, chairman of the board of Dominion Natural Gas Co., Ltd., Buffalo, N. Y., was elected president of the association. He succeeds D. K. Yorath, Edmonton. P. W. Geldard, Toronto, was elected first vice president, and F. R. Palin, Chatham, Ont., was named second vice president.

Refinery Contract Let

WAINWRIGHT, Alta.—Wainwright Producers & Refiners, Ltd., has awarded Fluor Corp. of Canada, Ltd., the engineering and construction contract for a 3,000 bbl. expansion of its refinery here.

Construction of a crude unit, viscosity-breaker, and ethyl blending plant will begin immediately. Work is scheduled for completion in early 1955. Engineering will be handled by H. G. Acres & Co., Ltd., Niagara Falls, Ont.

The refinery currently has a capacity of 800 bbl. per day.

TORONTO WILL GET FIRST GAS through 20-in. line being built by Western Pipe Lines from near Niagara Falls to a point west of the city. Consumers Gas will lay connecting 20-in. (dotted line) from northern terminus on into Toronto.

Trans Canada Ok'd

Tentative approval given, work started on spur line

OTTAWA—The Board of Transport Commissioners has completed hearings on Trans Canada Pipe Lines' proposed big-inch natural-gas carrier from Alberta fields to eastern Canada.

Justice J. D. Kearney, chief commissioner, informed the company that the line—which would be the largest ever built—has been tentatively approved by the board, but that a permit would not be issued until additional information on the project was submitted.

Contacted in Dallas, an official of Trans Canada said that this additional information had been compiled and would be placed before the board immediately. The nature of the information was not disclosed.

The company still thinks construction can be started in time to deliver gas to Winnipeg by late fall of 1955 and to Montreal about a year later.

Gas to Toronto . . . Meanwhile, construction work was scheduled to begin late last week by Western Pipe Lines, Ltd., a wholly owned subsidiary of Trans Canada, on 80 miles of 20-in. gas line from the vicinity of Niagara Falls on the United States-Canadian border to a point on the Peel County line in Ontario north of Oakville and west of Toronto (see map). Shipments of pipe for the line were completed during the last week in June. Construction contract was let to a Toronto construction contractor.

This line will be used to beef up the Toronto area market for natural gas until full-scale deliveries through the Trans Canada main line can begin. Gas will be supplied by Tennessee Gas Transmission Co. *(The Oil and Gas Journal, May 3, page 71)*, and turned over to Western at the Canadian border. Western in turn will deliver the gas at the northern terminal west of Toronto to Consumers Gas Co. Consumers will carry it on into Toronto through a 21-mile, 20-in. line scheduled to go into operation in November. Construction contract for this spur was let by Consumers last week to Gregg, Inc.

Frobisher Success Assured

REGINA.—The team of Canadian Gulf Oil Co. and Canadian Devonian Petroleum, Ltd., has been assured commercial success in the Frobisher area of southeastern Saskatchewan.

Latest drill-stem test of the Charles limestone of its Canadian Gulf-Canadian Devonian 1 Quinn step-out to the light oil discovery in the Frobisher area resulted in a recovery of 4,620 ft. of clean, water-free, 38° gravity oil. The test, second run in the section, indicated between 16 and 26 ft. of pay zone in the Charles limestone.

The well was drilled to the Mission Canyon member of the Mississippian section at 4,694 ft., but drill-stem tests failed to show any oil. The well is expected to be plugged back to the Charles limestone for production tests.

The 1 Quinn located ½ mile south of the 9 Quinn discovery well and ¾ mile southwest of 11-35 Moffat. It lies 24 miles east and 6 miles north of Estevan and 3 miles northwest of Frobisher.

Reservation Sale Slated

EDMONTON. — The Alberta Government is planning to hold its first sale of drilling reservations on crown reserve lands on July 7.

Under new regulations, oil companies will bid on drilling reservations on six parcels of unproven land scattered throughout the province.

Successful bidders will be required to drill wells to a specified depth within 1 year. They then will be entitled to lease petroleum and natural-gas rights on portions of the land.

H. H. Somerville, deputy minister of mines and minerals, said the new regulations are designed to encourage development in "wildcat" areas presently overlooked.

American Picks Date

Construction scheduled to start August 1 on big products line from Gulf to East Coast; high tax writeoff granted

NEW YORK.—Officials of American Pipe Line Co. say construction will start by August 1 on a 1,425-mile, 500,000-bbl. per day products line from the Gulf to East Coast—but industry observers express doubts about an early start on the controversial project.

The Office of Defense Mobilization has granted American a 40 per cent accelerated amortization on the $170,000,000 line. This is 15 per cent above what normally is granted pipeline projects.

Financing is the big question concerning the line, which is proposed from Beaumont to Newark. There is no government guarantee of financial aid. Company spokesmen say the financing will be handled privately, with about 25 per cent equity financing and 75 per cent mortgage capital.

A company spokesman said financing arrangements are progressing favorably and are being handled by White Weld & Co., one of the owners of the line.

Representatives of the pipeline company were meeting with "buyers of the bonds"—whom he declined to identify—late last week in New York.

A company executive said a portion of the right-of-way has been obtained, but declined to specify what percentage. The company also has announced orders for 300,000 tons of main pipeline have been placed by Engineers, Ltd., a subsidiary of one of the owners of the pipeline and contractor for the project.

Seeking customers . . . Another official said the company has been negotiating with major refining companies in the Houston-Beaumont-Port Arthur - Lake Charles area and has obtained so-called "letters of usage" from some of them.

These letters, the official said, are to the effect that refiners signing them will use the line if a tariff for the project is approved which will cut their present transportation costs to the East Coast and if they can be shown there are satisfactory markets along the line. This boils down to the fact that Gulf Coast refiners, many who operate their own tanker fleets, will use the line if it will save them money.

The official said refiners could ship to point east of Cincinnati at roughly 10 cents a barrel cheaper through the line provided throughput was in the neighborhood of 200,000 to 300,000 bbl. daily. If commitments come to only 50,000 bbl. or so, the line could not compete with tankers, he added.

Need I.C.C. action . . . Firm commitments to use the line will not be made until the Interstate Commerce Commission sets an official transportation tariff, which is expected to be soon. The official tariff may be either higher or lower than the tentative figure currently quoted.

The firm received the larger quick tax writeoff due to the defense aspects of the line. The company estimates its initial commercial volume will be only about 250,000 bbl. per day. The excess capacity will be a standby facility to be used in event of a national emergency, which falls in line with the National Security Council's demand for defense facilities to move 1,000,000 bbl. of oil overland to the East Coast in event of war.

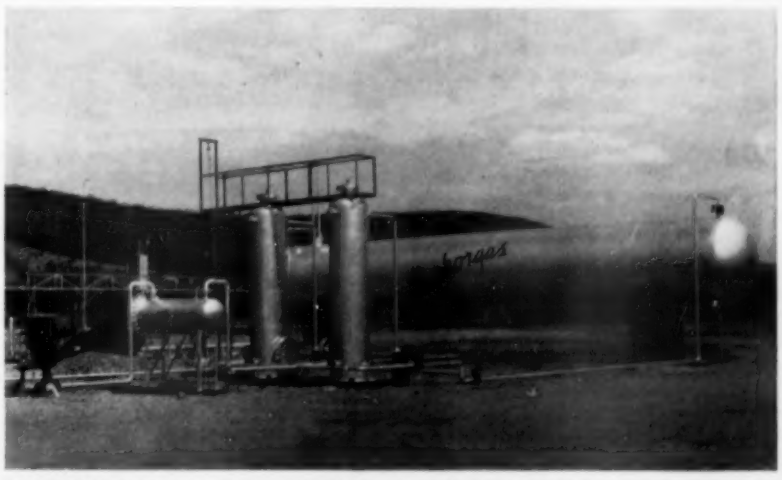
The major interests in American Pipe Line are Paul Ryan, president of National Refining Co.; Burt E. Hull, president of Trans-Arabian Pipe Line Co.; Gordon W. Reed, chairman of Texas Gulf Producing Co.; White Weld & Co., senior partner in an investment banking firm; Swinerton & Walberg, of which Engineers, Ltd., is a subsidiary; Johnston Avery, vice president of International-African Corp.; and Henry James, New York attorney.

Anchor Opens L.P.G. Cavern

BATH, N. Y.—The liquefied petroleum gas industry moved closer to achieving a balance in supplying L.P.G. to New York's concentrated consumer area last week when Anchor Petroleum Co. formally opened its new 140,000-bbl. underground storage plant here.

Booming underground storage construction in the industry is still concentrated in production areas and a more favorable balance of storage in consumer areas is a progressive step. *(The Oil and Gas Journal, June 7, 1954, page 66).* Far from the production areas of southwestern United States, the new Anchor facility will furnish storage during the relatively slack demand periods of the summer and aid in releasing tank cars for long hauls when L.P.G. demand ebbs.

W. A. Baden, president of Anchor was host to approximately 250 guests at the formal opening here July 1. S. G. Branyan, chief engineer for Anchor explained the operation and demonstrated methods for unloading tank car and injection into storage wells. Branyan reversed the process to demon-



ANCHOR PETROLEUM'S newest L.P.G. handling plant includes 30,000-gal. propane storage tank aboveground, two vertical dehydrator towers and one horizontal separator and injection pump and vapor compressors. The 10-spot tank car rack is in the background.

STORAGE WELL equipment is located in a cellar with a removable housing necessary because of New York's severe winters. The water system manifold is in the foreground and the well head equipment at the back.

strate also the recovery procedure, including dehydration, testing and loading cars.

Capacity . . . The present storage operation includes two caverns in the Syracuse salt section, which have been leached out to approximately 70,000 bbl. per well. Top of the salt is found at 2,950 ft. and the base of the clean salt section is 3,300 ft. Hard dense Helderberg limestone, approximately 300 ft. thick, forms an ideal roof for the storage caverns.

Both wells were drilled with cable tools with 2½ months required for each well. The washing process required approximately 3 months. The principal casing string, 7-in. o.d., was cemented in the Helderberg lime, and 3½-in. o.d. external upset casing was run to base of the salt. The well head is designed to permit pulling and/or running of tubing under pressure if the need arises.

Surface facilities . . . Include 15-car railroad spur with loading rack and truck loading connections. Injection equipment consists of an engine-driven 5 by 10-in. duplex pump. This pump assembly was first used for washing out the cavity and later converted to propane injection service by changing liners, pistons and valves.

Anchor's dehydration system at Bath is basically the same as that previously employed successfully at Hattiesburg, Miss., and Midland, Tex., plants. At Bath the water-leg of the free water knockout has an insulated heating coil to prevent freezing in the subzero climate. Two dehydrators towers are charged with calcium chloride. The second vessel is a precautionary measuse since a single unit has adequate capacity to dry the entire plant output at both Hattiesburg and Midland plants.

Ammonia Future Good

Spencer executive predicts consumption to double during next 12 years; 10-year period of shortages ended July 1

George H. Weber

NEW YORK.—Consumption of nitrogen products for industrial and agricultural uses should double in the next 12 years, J. R. Riley, Jr., vice president of Spencer Chemical Co., told the New York Society of Security Analysts here last week.

Riley said this stepped-up demand for nitrogen products is expected to result in a fairly good balance between supply and demand of the products despite the record expansion of synthetic ammonia capacity in the United States.

The prospects of continued increases in demand finds Spencer planning to add to the company's present capacity for producing 1,000 tons of ammonia daily.

For the year ending July 1, the supply of synthetic nitrogen fertilizers caught up with demand, ending a 10-year period of shortages. This balance should hold for the next two seasons, Riley said.

He does not agree with some observers who contend the ammonia supply will hit a level that threatens the industry's present prices. The coming year's production of synthetic nitrogen products is essentially contracted at this time at about the same prices prevalent during the past year, he said.

Based on population . . . For the extended future, Riley based demand estimates on an anticipated population growth from the present 165 million to 218 to 220 million by 1975. He said this will support a demand exceeding five million tons of nitrogen by 1965-66, with even greater consumption during the next decade. For the next 2 years, the estimate of supply and demand indicates an excess of only 6½ to 7½ per cent.

Riley sees synthetic ammonia as the nitrogen source to meet future demand increases with byproduct and organic sources remaining essentially constant. On the demand side, agricultural consumption will dominate other end uses. Industrial demand will increase, but not on the same scale as the agricultural demand, while military needs will taper off unless there is another war.

He presented a breakdown of supply and demand for the next 2 years and a demand forecast for the 1965-66 season was included, as shown in the accompanying table.

Natural-gas source . . . The production goal of 3,500,000 tons of total nitrogen by 1955-56 will comprise nearly 82 per cent synthetic ammonia as contrasted with the 76.5 per cent represented by that basic chemical in the year just ended. Although the speaker did not discuss the breakdown of basic feedstocks consumed in synthesizing ammonia, over 80 per cent of current production is based on natural gas.

Of ten certificates of necessity recently granted to ammonia projects by the Office of Defense Mobilization, about 70 per cent of plant investment was earmarked for plants based on natural gas, and 15 per cent was represented by a project which plans to util-

Estimated Nitrogen Supply and Demand

(Figures in thousands of tons)

	1953-54	1954-55	1955-56	1965-66
Supply:				
Synthetic ammonia	2,100	2,500	2,850	
Byproduct nitrogen	180	180	180	
Organic nitrogen	40	40	40	
Imports	430	430	430	
Total	2,750	3,150	3,500	
Consumption:				
Agricultural	1,900	2,100	2,300	3,900
Industrial	525	600	675	1,250
Conversion losses*	95	120	135	250
Military	100	50	50	50
Exports	50	75	75	75
Total	2,670	2,945	3,235	5,525
Estimated oversupply	80	205	265	
Per cent oversupply	3	6½	7½	

*Losses in converting ammonia to nitric acid, nitrogen solutions, etc.

ize heavy fuel oil as a source of hydrogen, converting to natural gas in the future if an economic supply becomes available.

Heavy fuel source . . . This project, proposed by Columbia River Chemicals, Inc., will be the first to be based on liquid petroleum fractions. Construction is scheduled to start later this year.

Tail-gas source . . . Another emergent source of petroleum-derived hydrogen is the tail gas from catalytic reformers which are presently seeing a record construction program. The first such use of reformer hydrogen was recently initiated as the Atlantic Refining Co. placed a 100-ton per day unit on stream at Philadelphia. Shell Chemical Corp. is beginning an expansion project at the Pittsburg, Calif., ammonia plant. The new capacity will utilize hydrogen-rich byproduct gas from a new catalytic reformer recently placed on stream at Shell Oil Co.'s nearby Martinez refinery.

Deep Rock Buys Wells

TULSA.—Deep Rock Oil Corp. has purchased two-thirds of the working interest in 28 flowing oil wells in Coke County, Texas, from F. Kirk Johnson and associates, of Fort Worth, Tex. The entire transaction involves consideration of $5,400,000. Deep Rock will be the operator of the 28-well project. The wells are in Jameson-Strawn field.

Refinery Job Let

Tide Water eyes several sites on Delaware River

NEW YORK.—Tide Water Associated Oil Co. has awarded an engineering contract for the new 100,000 bbl. per day East Coast refinery to C. F. Braun & Co., Alhambra, Calif. Plans for the new refinery, first announced late in April, are progressing, but no site has yet been selected.

Several locations are now under consideration in the Delaware River Valley which includes sections of New Jersey, Pennsylvania and Delaware. One site being considered is Delaware City, Del.

The new refinery, which will cost an estimated $75,000,000, will replace the existing Bayonne, N. J. plant, one of the oldest on the Eastern Seaboard. At the annual meeting held recently in New York, D. T. Samples, Tide Water president, told stockholders that operations at the 87,000-bbl. per day Bayonne refinery would be gradually reduced while the new plant is being constructed.

Oil Companies Income Up

NEW YORK.—An annual survey conducted by Chase National Bank of New York showed the net income of 35 representative American oil companies increased 8.8 per cent in 1953 to $2,258 million.

Frederick G. Coqueron, Chase petroleum analyst, attributed the group's increase to a 3.5 per cent jump in crude-oil output and expected sales at higher prices made possible by removal of price ceilings during the first half of last year.

World crude production outside the Soviet sphere jumped 5.5 per cent in 1953 to an all-time high of 11,834 thousand barrels per day, the study disclosed. Demand increased 6 per cent to a new high of 12,356 thousand barrels daily.

Alaskan Test Spudded

BARTLESVILLE, Okla. — Phillips Petroleum Co. and Kerr-McGee Oil Industries have spudded a second wildcat on a million-acre block of leases on the southern coast of Alaska.

Phillips and Kerr-McGee hold operating rights on the large acreage and plan several tests in the area.

The first test was recently abandoned as a dry hole at 4,837 ft. *(The Oil and Gas Journal, May 24, page 125).*

Lovell Refinery Passes 15-Year Safety Mark

LOVELL, Wyo.—First-aid training is an established routine at Ohio Oil Co.'s refinery here—but the skill is seldom needed.

There hasn't been a lost-time accident at the 6,000-bbl. refinery in more than 15 years.

The refinery went on stream in November 1937. Just a year later, on November 25, 1938, a boiler fireman helping a watchman one night stepped on a loose stone, slipped, hurt his back, and was off work for 22 days. That is the last lost-time accident on record.

J. C. Askam, Ohio's chief safety engineer, credits the enviable safety record to several things:

. . . **A continuous survey** to spot and eliminate hazards to workers and situations which could cause a fire.

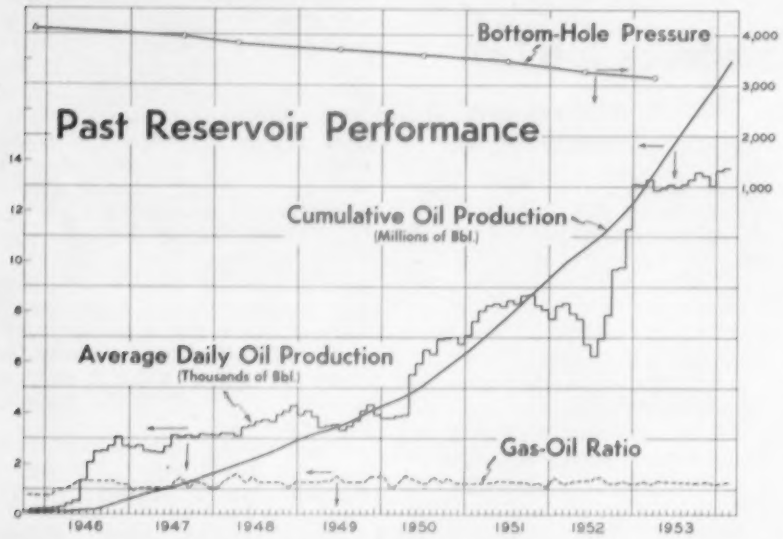
. . . **Personal interest** of the supervisory staff in accident prevention.

. . . **Fire drills** which simulate actual emergencies.

. . . **Recognition** by top management of the value of an active and extensive safety program.

The company's safety program, in fact, has been greatly expanded in the last 2 years. The expansion involved addition of experienced safety engineers to assume responsibility for accident and fire-prevention problems in the production, marketing, and transportation departments, as well as in refining.

The Lovell refinery started out in 1937 as a 1,000-bbl. topping plant. A vacuum asphalt unit was added in 1940. Capacity of the refinery was increased to 6,000 bbl. during the war. Most recent addition was a cat cracking unit built last year.



Atlantic boosts recovery with . . .

. . . High-Pressure Gas

Robert J. Enright

DALLAS.—High-pressure gas injection is destined to play an important part in the producer's never-ending struggle to cut the percentage of oil which must be left in the earth because of lack of a way to get it out.

The initial high-pressure gas-injection experiment, Atlantic Refining Co.'s project in University Block 31 Devonian reservoir in Crane County, West Texas, has proved highly satisfactory.

Atlantic estimates that the process will recover 52 per cent of the oil in place in Block 31. This is despite the fact that the gas, due to its low viscosity, will sweep only 58 per cent of the reservoir. Recovery from the area swept is phenomenally high—about 90 per cent.

The 52 per cent recovery figure compares with an estimated 40 per cent of oil in place recoverable from the pool via water flooding. More of the reservoir, about 81 per cent, would be swept by the water, Atlantic calculates, but recovery in the swept area would total about 50 per cent because of the poor response of this particular rock to water. Only 25 per cent of Block 31 oil, Atlantic estimates, could be produced under natural depletion—primarily solution-gas drive with some help from edge water.

The cost of high-pressure gas injection in Block 31 is considerably less, Atlantic says, than water flooding on a similar scale would have been. The big factor here is the much larger number of injection wells (at roughly $200,000 each) which a water flood would have required. It is estimated conservatively that at least twice as many input wells would have been necessary for water injection.

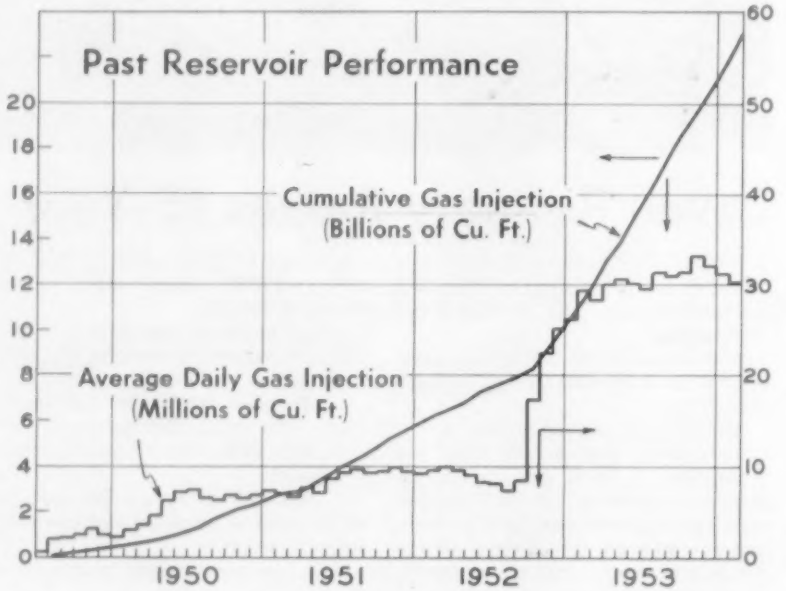
Block 31 performance . . . The reservoir was discovered late in 1945, and it became apparent soon after that pressure maintenance should be considered because of the expected drive mechanism and relatively low well productivity.

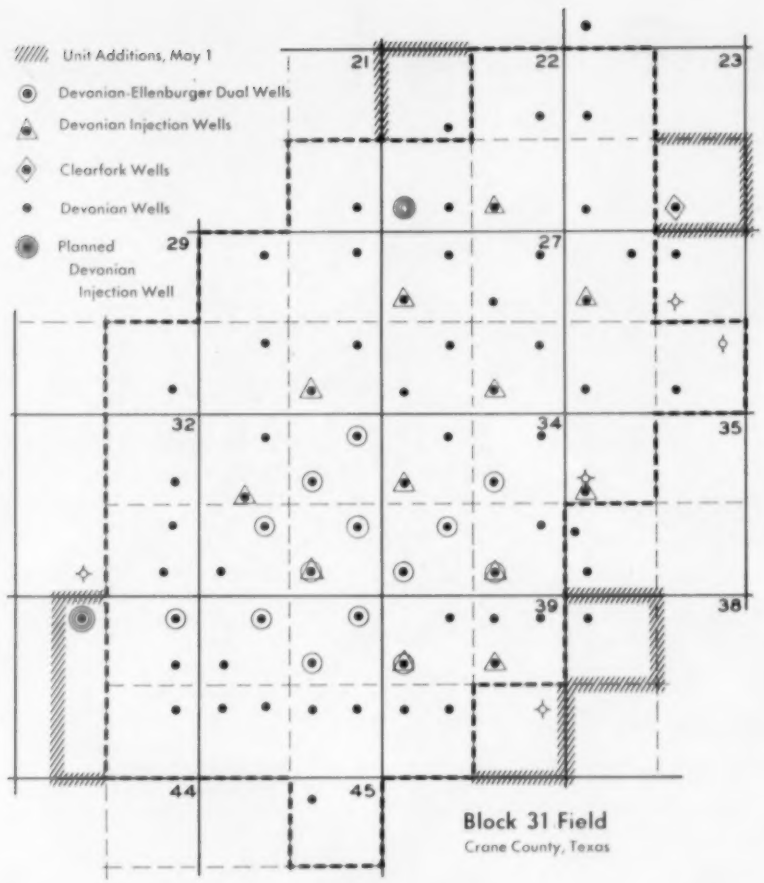
Limited gas injection was started through one well in June 1949. Another input wells was added in January of 1950, two more in 1951, and another in April 1952. Eight more input wells, swelling the total to the current 13, were added by June 1953. Atlantic now has application before the Texas Railroad Commission to add still another two input wells.

Daily oil production was running about 3,600 bbl. when injection was started in June 1949 and while the pool was still being defined and developed. By October 1952, when the full pressure-maintenance program began functioning, production was running about 10,000 bbl. daily. It jumped sharply to 13,000 bbl. as of the first of 1953 and has increased since to the current rate of 13,500 bbl. daily.

The field had produced 18,800,000 bbl. of oil as of May 1. About 3,700,000 bbl. was produced during the 3½ years prior to the start of gas injection. Cumulative output totaled roughly 12,000,000 bbl. at the first of December in 1952, just after the start of full-scale, field-wide injection. The field thus has produced roughly 6,800,000 bbl. of oil in the 17 months between the first of December 1952 and the first of May 1954.

Bottom-hole pressure, originally 4,145 psi., had dropped to 3,650 psi. when injection started. Pressure declined gradually to about 3,280 psi. by





June 1952. The pressure declined further to 3,160 psi. during the next year, but this drop was believed to have occurred before full pressure-maintenance began in October 1952. Atlantic recently completed its 1954 bottom-hole pressure survey. This survey showed average reservoir pressure to be 3,245 psi.—an increase of 85 psi. since the June 1953 survey and during the first full year of field-wide pressure maintenance.

Gas is being injected into the 8,000-ft. Devonian limestone at a rate of about 31,600,000 cu. ft. daily and at a well-head pressure of 4,000 psi. All produced gas is being injected and make-up gas, on the order of 45 per cent of that injected, is purchased from El Paso Natural Gas Co.

Gas-oil ratios in the field, originally about 1,300:1, have remained constant at this figure because the field pressure has been maintained above the bubble point.

Atlantic engineers estimate that the volume of the reservoir swept by the roughly 23 billion cubic feet of gas injected to date is about 5 per cent of the ultimate sweep. There has been no evidence of channeling or coning.

There are now 7,040 acres in the unit, formed by Atlantic, Champlin Refining Co., Continental Oil Co., and Phillips Petroleum Co.

Acreage has been added three times to the original 4,160-acre project. About 1,120 acres were taken in in January of 1950, another 960 acres added in mid-1952, and a final addition of 800 acres was approved by the Texas Railroad Commission in April of this year (see map).

How it works . . . High-pressure gas entering the producing formation passes over a residual oil and is enriched through contact with it. Through this enrichment, the gas achieves a high degree of solubility in the virgin oil in the reservoir. As the enriched gas moves on through the formation it creates a bank of swollen liquid which is light in gravity and approaches the viscosity of the virgin reservoir oil.

The swollen liquid bank in what Atlantic calls the transition zone displaces the virgin reservoir oil, which is produced. In effect, the oil is washed out of the reservoir as if by kerosine or some other solvent.

The result of the continuous cycling of the high-pressure gas is that in the formation in the vicinity of the input well is a zone containing only dry gas and a heavy residual product estimated at about 15° gravity.

The composition of the injected gas is not regarded as important by Atlantic since its content of L.P.G. and natural-gasoline components is largely determined when it passes over the residual oil.

Application . . . Generally, high-pressure gas-injection projects such as Atlantic's, are feasible in reservoirs with bottom-hole pressures of 3,000 psi. or above. This ordinarily means a depth of 6,000 ft. or greater. Required pressure fluctuates somewhat according to temperature and gas-oil ratio of the reservoir oil but more according to the amount of "intermediates" (natural gasoline and L.P.G. components) in the oil. The more of these lighter components there are in the crude, the smaller the pressure required to make the gas and the black oil miscible. Thus the higher the gravity of the oil in the reservoir, the better the process will work.

The process would not generally be economically feasible, these engineers say, in reservoirs where an active natural water drive is present or in those which are fractured extensively. If field conditions were just right, it is believed that the process could be used under these circumstances, but in most such cases other recovery methods would prove more desirable economically.

McBride Buys Mexican Oil

BROWNSVILLE, Tex.—McBride Oil & Gas Corp., has received by tanker here, 107,000 bbl. of Mexican crude oil. The first shipment of a total of more than 13,500,000 bbl. which will be delivered at the firm's Brownsville refinery over a 5-year period under a contract with Petroleos Mexicanos.

The contract with the Mexican government oil agency calls for shipments averaging 7,500 bbl. daily over the 5 years at a total expenditure of $22,000,000.

Announcement of the arrival of initial shipment was made in San Antonio by Lynn McBride, president of McBride Oil & Gas Corp.

Texas Refiners File Appeal

AUSTIN — The 10 refining companies charged by Texas with violating antitrust laws by raising wholesale gasoline prices uniformly in 1946 and 1947 last week carried the fight to the Texas Supreme Court.

The refiners are appealing from a

decision by the Austin Court of Appeals that the case should be remanded to District Court for jury trial. The appeals court decision reversed an earlier decision by Judge Charles O. Betts of the District Court that the state failed to establish cause for action.

Defendants in the suit are: The Texas Co., Sinclair Refining Co., Magnolia Petroleum Co., Cities Service Oil Co., Continental Oil Co., Standard Oil Co. of Texas, Gulf Oil Corp., Phillips Petroleum Co., Humble Oil & Refining Co., and Arkansas Fuel Oil Corp.

Co-op Plan Passes

Sharing liquids from gas plant scheduled in Texas

AUSTIN.—The Texas Railroad Commission last week approved an application by Southern Production Co. for construction and operation of cooperative facilities for extracting liquids from gas produced in Pledger field of Brazoria County.

The application, made by Southern Production for itself and other producers in the field, was the first handled by the commission under authority granted it under a new Texas law permitting such cooperative agreements.

The new Pledger field gasoline plant has a processing capacity of about 190,000,000 cu. ft. daily. It began operation in February and now is operating at near capacity. The plant is a high-pressure absorption type. It processes wet gas from 33 wells producing from the Marginulina and Frio sands at about 6,800 ft.

The agreement was executed by the five largest producing companies in the field — Southern Production, Humble Oil & Refining Co., Sun Oil Co., Union Producing Co., and Gulf Oil Corp. They own 99 per cent of the working interest. It provides for sale of gas by the operators in the field to the plant. The plant remits 70 per cent of the net proceeds of the liquid products back to the operators. Ownership of residue gas remains with the operators. Sharing of liquid products is determined on a basis of acre-feet of productive sand. Charges to the operator for use of the plant gathering system is based on operating expenses compared to the operator's throughput.

Under the law, an agreement such as the Pledger contract can be approved by the commission only if secondary-recovery operations are not necessary or feasible. It was established at the hearing on the agreement *(The Oil and Gas Journal, June 7, page 77)* that secondary recovery in Pledger was not feasible because of the extremely lean nature of the gas, the existence of a water drive, etc. In its order approving the project, the commission found that the cooperative facilities would result in the recovery of about 25 bbl. of liquids per M.c.f. of gas, as compared with 9 bbl. per M.c.f. otherwise.

Discovery Confirmed

Andrews County area has second Ellenburger well

MIDLAND.—Discovery of a second and larger Ellenburger well by Ralph Lowe in a Permian producing area of central Andrews County has been assured by drill-stem tests.

Lowe's 1 Deep Rock opened Ellenburger production in March of this year, and on the map is designated No. 1.

The confirmation well, located 1¾ miles to the south, is Ralph Lowe 1 Southland Royalty, No. 2 on the map, and is located in NW NW 21-A46-PSL Survey. This well went into the Ellenburger, by electric logs, at 12,173 ft. Its minus datum point of 9,014 ft. checks 24 ft. high to the discovery.

First drill-stem test of the section between 12,160-12,209 ft. had flowing oil in 1 hour and 35 minutes, and tanked 37 bbl. of 43° oil in 70 minutes. Maximum flowing pressure was 3,400 psi.

Second drill-stem test, between 12,207-12,236 ft., had oil in 19 minutes and gaged 125 bbl. of oil in 1 hour through 1-in. top choke. Bottom-hole flowing pressure ranged from 2,035-4,605 psi., and 30-minute shut-in pressure reached 5,150 psi.

Testing to total depth, between 12,238-12,294 ft., gas flowed in 15 minutes but it did not flow oil. At 12,294 ft. the well had a 121-ft. Ellenburger section, apparently all oil-bearing, and was still above water. Plans were to drill ahead after making additional surveys.

Ralph Lowe 1 Deep Rock, first pre-Permian test in this area, flowed 407 bbl. of 43° oil a day through 14/64-in. choke, from Ellenburger pay between 12,252-12,312 ft. The two wells lie along the northwest-southeast trend of Ellenburger fields shown by the shaded portions on the map.

Cycling Overruled

Commission favors majors' plans for Woodlawn field

AUSTIN—The Texas Railroad Commission has held that cycling or pressure-maintenance operations are not feasible for the Pettit producing formation of big Woodlawn field, Harrison County, East Texas.

The ruling resulted from a hearing held by the commission early in March *(The Oil and Gas Journal, March 15, page 97)* at which it called on operators in the field to show cause why gas produced should not be cycled and why pressure maintenance of oil reservoirs should not be conducted.

The operators took two widely separated positions at the hearing. Stanolind Oil & Gas Co., the field's largest operator, Warren Petroleum Corp., and a few others argued that cycling or pressure maintenance would be uneconomical and impractical without unitization. Stanolind added that unitization would be extremely difficult, if not impossible, because of the many divergent interests in the field.

D. E. and R. J. Whelan, among the 24 independent operators pressing for a cycling order, contended that there was pressure communication between gas and oil zones in the field and evidence of migration of oil.

Plan adopted . . . The commission accepted the Stanolind-proposed volumetric formula for gas-well production in the field. This, according to Arthur Barbeck, the commission's chief engineer, had the effect of setting up 160-acre proration for gas in the field. The formula will apply to gas wells for a period of 6 months on a temporary basis to determine whether oil is migrating into the gas cap at the production rates occasioned by the formula.

The commission also required the taking of bottom-hole pressure surveys every 2 months beginning the first of July.

Imports Formula Urged

I.P.A.A. proposes plan based on reciprocal trade; would place added tariff on Middle East crude, exempt Americas

WASHINGTON. — A new formula for assessing higher duties on imports of oil in excess of certain quotas has been proposed by the Independent Petroleum Association of America.

The formula would give each foreign country a quota determined by its total purchases of United States merchandise during the preceding year. Imports within the quota would pay the present import taxes. Imports above the quota would pay $1.05 per barrel, whether crude or products.

Present duties are 10½ cents per barrel on crude oil above 25° gravity, 5¼ cents per barrel on heavy fuel oil and crude below 25° gravity, and varying higher rates on other products.

Aim of formula . . . The principles of the proposal were worked out at the meeting here last month of the association's import policy and executive committees. The aim, it was explained by Russell B. Brown, general counsel, is to encourage trade on a reciprocal basis with all countries, promote Western Hemisphere solidarity, restrict imports from Eastern Hemisphere sources, and discourage excessive imports which restrict production and development of domestic oil resources.

Brown explained that under this formula no Western Hemisphere country would be affected, but on the basis of the 1953 export-import trade approximately 231,000 bbl. daily of oil from the Middle East would be subject to the $1.05 tax.

Practical effect . . . Brown explained the "practical effect" of the policy would be to permit approximately 800,000 bbl. daily of crude oil and refined products to be imported currently into the United States at the present low import tax rates as compared with actual 1954 imports averaging between 1,000,000 and 1,100,000 bbl. daily.

Imports from all Western Hemisphere countries could continue at current levels, subject to present import taxes. But most of the current imports from Eastern Hemisphere sources, primarily the Middle East, would be subject to the higher import tax rate of $1.05 per bbl., he said.

How it works . . . The I.P.A.A. formula specifies imports shall come into the United States on the present import tax rates and shall be determined in relation to United States exports to that country on the following conditions:

. . . For the first $100,000,000 per year of exports of United States merchandise: one barrel per year of United States oil imports for each $20 of United States exports.

. . . For the second $100,000,000: one barrel for each $10.

. . . For the third $100,000,000: one barrel for each $5.

. . . For exports in excess of $300,000,000: one barrel per year of United States oil imports for each $1 of United States exports.

Import Changes Under I.P.A.A. Formula

Country—	1953 exports of U. S. merchandise (dollars per year)	Imports permitted at present U. S. import taxes, per formula: Total barrels per year	Imports permitted at present U. S. import taxes, per formula: Average in barrels daily	Average in barrels daily: Actual 1953 imports	Average in barrels daily: Would have been subject to $1.05 per bbl. tax
W. Hemisphere:					
Canada	$2,941,095,187	2,676,095,187	7,331,800	8,000	
Mexico	635,471,985	370,471,985	1,015,000	37,000	
Venezuela	510,833,757	245,833,757	673,500	*657,000	
Colombia	282,047,700	31,509,540	86,300	*65,000	
E. Hemisphere:					
Indonesia	$103,999,287	5,399,287	14,800	40,000	25,200
Saudi Arabia	76,317,330	3,815,866	10,500	102,000	91,500
Iran	21,441,602	1,072,080	2,900		
Iraq	18,896,784	944,884	2,600	4,000	1,400
Kuwait	15,739,608	786,980	2,200	106,000	103,800
Bahrain	8,036,139	401,807	1,100	1,000	100
Qatar	978,823	48,941	100	9,000	8,900
Misc. countries	(†)	(†)	(†)	21,000	(†)
Total				1,050,000	230,900

*Includes Netherlands West Indies imports of fuel oil and other refined products on the basis of being derived 90 per cent from Venezuelan crude oil and 10 per cent from Colombian crude oil. †Details not shown by countries.

Coal's Battle Begins

President urged to assist industry struggle with gas

WASHINGTON.—The coal vs. gas fight was carried directly to the White House last week.

A delegation of nine members of Congress from coal-producing states and 14 representatives of the industry told President Eisenhower the coal industry is facing critical economic problems and unless steps are taken to remedy them, the country faces disruption of one of its vital industrial and defense elements.

The group urged the controls on the use of natural gas to limit its competition with coal, but for the first time disclosed they would settle for a subsidy on freight rates on coal so that it could be competitive with the delivered price of gas.

Recommendations . . . This recommendation was one of five aimed directly at the oil and gas industry. It was also recommended that imports of residual fuel oil be limited, that aid be given in the more efficient refining of Venezuelan crude to reduce residual output, and that limits be imposed on natural gas from Canada.

In a lengthy brief, the group said it is not contending that all of the coal industry's troubles can be blamed on foreign residual oil. It admitted that dieselization by the railroads has taken away a market for 100,000,000 tons of coal annually and that natural gas had replaced coal in many industrial, commercial, and household uses.

Other recommendations included requiring the use of coal, where available, in all government installations in the United States and overseas, and revising government lending policies to eliminate the higher valuation now made by the Federal Housing Authority of properties heated by natural gas or oil.

New Policy Urged

Malone report blames State Department red sympathizers for our dependence on foreign sources of vital materials

WASHINGTON—The United States is far from being a "have-not" nation in oil and other raw materials for defense, the Senate interior committee was told last week.

But, a new national minerals policy emphasizing dependence on the Western Hemisphere is necessary if our natural resource industries are to be kept healthy, Sen. George W. Malone of Nevada said. Malone is chairman of a special subcommittee which has just completed a 10-month study of the availability of critical materials for war. Malone said, "the Western Hemisphere can become readily self-sufficient in the critical raw materials necessary to win a war or to maintain a balanced economy in times of peace." He declared procurement policies of the past "if continued could be fatal to the nation."

The report charged that policies which have led to our becoming dependent to considerable extent on distant foreign resources of vital materials were sparked by Communist sympathizers formerly in the government "who put the interest of totalitarian Asiatic states above the welfare of the United States, and who were willing to sacrifice our economy to the strengthening of areas within the orbit of Soviet influence or attack."

Responsible Defense Department officials, the report pointed out, admitted during subcommittee hearings that it would be difficult and perhaps impossible to protect oil transportation from the Middle East to the United States in time of war.

Recommendations . . . Malone made a number of recommendations as a basis for the new national policy he demanded, among them the following applying specifically to oil:

. . . **"Closest cooperation"** between the nations of the Western Hemisphere, which is the only dependable source of the necessary critical materials in time of war and which can be defended.

. . . **Return to Congress** of all matters relating to tariffs and the regulation of foreign trade, to insure needed protection to domestic producers.

. . . **Studies** with a view to improved regulation of petroleum, gas and coal resources and development to assure maximum availability of domestic fuels for both the peacetime economy and national security.

. . . **Appropriations of $50,000,000** annually to establish and operate a comprehensive 5-year program of laboratory, pilot plant and exploratory research into new uses, synthetics, substitutes and replacements of critical materials.

. . . **Rejection of "international controls** of production, prices and supplies of critical materials except by legislative action by Congress."

The subcommittee found conclusive evidence that our domestic and foreign policies "have been based on the false assumption that the United States is a 'have-not' nation."

Reserves cited . . . "The United States cannot possibly exhaust its present and potential fuels supply, including petroleum and coal, in the foreseeable future," the report asserted.

There are enormous oil reserves in the shales of Colorado, Wyoming, Utah, Kentucky, Indiana and Ohio, as well as in Canada, the report pointed out. "Experimental work done by the Union Oil Co. and Bureau of Mines in pilot plant operation shows that petroleum from this source is entirely practicable and that vast amounts of oil may be possible in the foreseeable future.

"Oil is mineral aggregate that can be extracted at a profit. Through the constitutionally regulated foreign trade the incentive for risk capital necessary to develop additional reserves and establish 'going-concern' critical material industries will be available."

Cargo Ratio Fought

Administration fights bill urged by maritime service

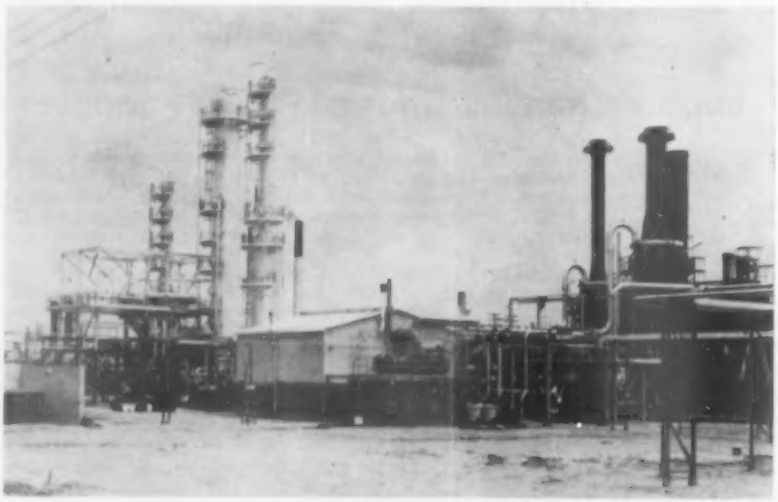
WASHINGTON.—Legislation requiring that 50 per cent of all cargoes paid for with public funds be carried in privately owned American ships is being pressed in Congress over the opposition of the administration and at least nine major foreign maritime nations.

The bill, already passed by the Senate, would extend the 50-50 ratio set up by Congress on certain government shipments as a permanent national policy.

The continued operation of 47 government-owned tankers by the Military Sea Transportation Service while privately owned tankers are laid up for lack of cargoes was cited as a serious instance of government competition with private business by Francis T. Greene, executive vice president of the American Merchant Marine Institute.

Greene said there are 84 privately owned tankers lying idle in American ports, representing an investment of over $1 billion and costing their owners more than $500,000 a month just to keep in condition.

"For MSTS to operate a large fleet

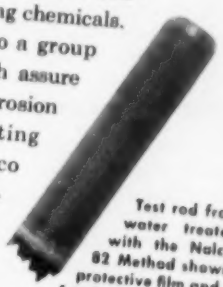


Mid-Continent Completes Platformer

Mid-Continent Petroleum Corp. has placed a new 7,500-bbl. Platformer on stream at its 60,000-bbl. West Tulsa refinery. The new unit will yield 7,200 bbl. or more daily of high-octane gasoline. Mid-Continent constructed the unit, which was designed and engineered by M. W. Kellogg Co. Work was completed in about 18 months. Construction is about 25 per cent completed on expansion of an alkylation unit at the refinery from 1,700 to 2,200 bbl. daily. The expansion is scheduled for completion this fall.

Forest of Facts on Nalco® RECIRCULATING WATER TREATMENT

NALCO Laboratories' continuous research program has gathered this forest of facts about protecting recirculating water systems. In the search for the most effective *and economical* formula, the metal rods shown have been rotated in all types of recirculating waters and treating chemicals. Results pointed the way to a group of Nalco Treatments which assure users against scale and corrosion in virtually any recirculating waters. For details on Nalco Treatment to fit your particular system, call your Nalco Representative, or write direct.



Test rod from water treated with the Nalco 82 Method shows protective film and freedom from any scaling or corrosive attack.

THE Nalco 82 METHOD MAY BE THE ANSWER FOR YOU

The Nalco 82 Method is particularly suitable for scale and corrosion control in recirculating water systems which fall within the characteristic limits given here. Check them to see if your system should have Nalco 82 Treatment:

- Equipment to be protected contains steel and/or brass.
- Hardness of makeup water is more than 50 ppm; and sulphates and chlorides, as sodium salts, are less than 150 ppm.
- Calcium hardness of makeup can be as much as 500 ppm.
- Silica content of makeup water up to 50 ppm.
- Total alkalinity of makeup more than 40 ppm.
- Recirculation rates between 100 and 100,000 g.p.m.
- Where non-toxic waste water is required.

Act today to get the certain, low-cost protection of The Nalco System. Full data on Nalco 82 in free Bulletin 68.

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THE Nalco SYSTEM . . . Serving Industry through Practical Applied Science

of tankers while the world's commercial tanker trade is seriously overtonnaged, disregards the fundamental principle of business-government relations," Greene declared.

Administration opposition to the legislation was explained by Harvey Klemmer, acting director of the State Department's office of transport, who said it would invite retaliation and strengthen what he said was a trend toward cargo preference actions by other governments.

Klemmer cited as an "extreme conclusion" of such a trend the recent contract between A. S. Onassis and the Saudi Arabian government which, he said, "may eventually give a virtual monopoly" to Onassis on oil exports.

The Saudi Arabia contract also drew the fire of Rep. Emanuel Celler of New York, who last month protested the arrangement to Secretary of State Dulles and Foreign Operations Administration Director Harold E. Stassen.

Depletion Allowance Assured

WASHINGTON.—The Senate, by a voice vote, last week shouted down amendments by Sen. John J. Williams of Delaware and Sen. Paul Douglas of Illinois to cut the oil industry's 27½ per cent depletion allowance.

The action assures safety of the industry's allowance for income tax computation for at least another year. The House previously had refused to alter the allowance.

Williams proposed a flat reduction of 15 per cent and Douglas offered an amendment which would leave the 27½ per cent allowance on incomes of $1 million or less, reduce it to 21 per cent on incomes from $1 million to $5 million gross income, and to 15 per cent for those with incomes above $5 million gross.

OGD Funds Voted

WASHINGTON.—Congress has given the Oil and Gas Division $250,000 for operation during the fiscal year which began July 1.

The OGD originally asked for $300,000, with approval of the Bureau of the Budget. The House allowed only $100,000, and the Senate voted the full amount and then settled in conference for $50,000 less.

In similar fashion, the fund for enforcement of the Connally Hot Oil Act, originally set at $150,000 and so approved by the Senate, was fixed at $140,000 instead of the $125,000 proposed by the House.

As finally passed, the bill provided $405,936,149 for all activities of the Interior Department, approximately $33,000,000 less than was provided for fiscal 1954. It is $21,665,000 less than the Senate had approved but $41,598,000 more than the House originally granted.

FPC Nomination Made

WASHINGTON. — Frederick K. Stueck of St. Louis, former chairman of the Missouri Public Service Commission, was nominated by President Eisenhower last week to be a member of the Federal Power Commission, succeeding Dale E. Doty.

Stueck, an attorney with offices in Clayton, Mo., is 48. He has been actively identified with Republican politics in Missouri for the past 25 years.

He served on the state public service commission for 2½ years before entering the army in October 1943. After his release in 1946 he became an executive of the Transit Casualty Co., but in recent years has been engaged in the practice of law.

Rubber Corporation Formed

WASHINGTON.—A new federal corporation has been created to operate the government-owned synthetic rubber producing facilities until they are sold next year.

In an executive order, President Eisenhower directed the Secretary of the Treasury to organize the Federal Facilities Corp. to take over the rubber and tin-smelting operations.

The rubber facilities are to be sold next year by the Rubber Production Facilities Disposal Commission which is now conducting negotiations with the top bidders among the 36 companies which made offers to buy in May.

March Gas Sales Up

WASHINGTON.—Natural-gas sales of 37 pipeline companies reporting to the Federal Power Commission increased 48,000,000 M.c.f. in March over February and were 65,000,000 M.c.f. above March 1953.

Total sales were 577,532,000 M.c.f., of which 103,852,000 M.c.f. went to ultimate consumers and 473,680,000 M.c.f. to other gas utilities for resale. February sales were 539,189,000 M.c.f., of which 98,670,000 M.c.f. went to ultimate consumers and 440,519,000 M.c.f. to other utilities, and in March 1953 the total was 511,838,000 M.c.f., of which 97,215,000 M.c.f. went to ultimate consumers and 414,623,000 M.c.f. to other utilities.

ROCKY MOUNTAIN

Drilling Increases

Gas line approval boosts San Juan basin's activity

FARMINGTON, N. M.—New drilling locations in the San Juan basin of northern New Mexico are on the increase because of the approval of Pacific Northwest Pipeline Co.'s gas line to the Pacific Northwest.

A number of wildcats and 12 infield and extension locations were made in Rio Arriba and San Juan counties.

Also on the increase are new locations in western Wyoming and Colorado in the area to be crossed by the new pipeline.

El Paso Natural Gas Co. will drill a 15,000-ft. wildcat in the Pinedale unit of Sublette County, Wyoming. Pinedale is one of the largest structures in the Rocky Mountain region. Several wells and extensive seismic work have been reported on the structure. The unit contains 91,787 acres, primarily acquired by Malco Refineries, and with Continental Oil Co. having interest in the unitized lands. El Paso will earn an interest in the area for drilling the test.

New drilling locations in the Twin Buttes area of Colorado's Garfield County have also been announced. Leasing is picking up in the San Juan, Paradox, Piceance and Green River basins as a result of the projected pipeline. New firms are reported to be checking the entire region as a result of the FPC approval of the line.

Pure Enters South Dakota

DENVER.—Pure Oil Co. has taken assignment of 260,000 acres in South Dakota's Corson and Perkins counties, contemplating a seismic and possible drilling program.

The acreage was assigned by Union Oil Co. of California. Pure previously has not been active in the South Dakota portion of the Williston basin. Its major activity in North Dakota has been on a participation basis. Union is one of the largest leaseholders in the eastern and southern portion of the basin and has drilled a number of wildcats with Hancock Oil Co. and Signal Oil & Gas Co. Union recently adopted a policy of farmouts with resulting revision of staffs in the basin.

Controlling interest in some 300,000 acres of leases in eastern Williston areas of North Dakota has also been assigned to an independent operator by Union.

DRILLING CORE TESTS off the Louisiana coast by Humble Oil & Refining Co. is being done from a DeLong portable platform-barge. This unit, 80 by 206 by 8½-ft. thick, employs 10 big caissons which are sunk into the ocean floor for support.

Sulfur Is New Target

Humble begins 20-well drilling program in offshore area designed to evaluate sulfur as well as oil, gas deposits

William P. Sterne

GRAND ISLE, La.—Humble Oil & Refining Co. is now engaged in a drilling program designed to evaluate the possibilities of sulfur production as well as oil and gas leases in the Gulf of Mexico off Louisiana.

In what is probably the first major effort for a company to explore for sulfur deposits offshore, Humble has started a 20-well drilling program in the Grand Isle area off Jefferson-La-Fourche parishes, and the drilling is planned to be carried out within the next 2-year period.

Three such tests have already been drilled and a fourth is now under way in Grand Isle Block 18, about 8½ miles from the shore of Grand Isle in 50 ft. of water. The tests are being drilled from a DeLong portable barge, which is, in effect, a floating dock that sinks its own supporting caissons into the ocean floor, then "jacks" itself above the water level for the drilling operation.

No details have been released by Humble on results of the first three tests, but present plans call for the 20 wells to be drilled to a maximum depth of 2,500 ft. The first holes drilled will be used to gain subsurface data on several piercement salt domes in the area.

Humble has a permit from the United States Government which allows a reasonable period in which to complete the 20 test wells.

A substantial effort of the current project, Humble points out, is to locate and evaluate sulfur deposits. Development of any discoveries will have to await the evaluation of any sulfur deposits and a determination of the economic feasibility of offshore production.

Part of big program . . . The exploratory program is only a small part of Humble's big over-all project off the Louisiana and Texas coasts.

Entire cost of the tidelands program for the remainder of this year will be approximately $14,000,000 *(The Oil and Gas Journal, May 17, page 88).*

Humble's activities from its big Grand Isle base are getting into high gear. In addition to the 20 exploratory tests, the following work is either under way or will start soon:

. . . Three wildcats off Louisiana, one in South Timbalier Block 52, one in South Timbalier Block 54, and one in West Delta Block 30 (Pelican Island). Each is projected to 14,000 ft. to explore Miocene sands.

. . . Fourteen development wells on the flanks of piercement salt domes in Grand Isle Blocks 16 and 18. Two tests are planned to 13,000 ft., and 12 to 8,500 ft. Two of these development wells are already drilling from new platforms installed in the area.

. . . A 7-mile gathering line, of 10½ and 8-in. pipe, somastic coated, is now being laid from various platforms to Grand Isle. Capacity of the gathering system will be approximately 30,000 bbl. daily, and it is expected to be in operation by early July. Current production in the area to be served by this system is about 2,300 bbl. per day. Humble has 18 platforms off the Louisiana coast in the areas around Grand Isle and Timbalier Bay.

Big base . . . The Grand Isle base which Humble has operated since the initial discovery offshore in April 1948 is handy to all operations in the Grand Isle blocks and in Timbalier Bay.

About a thousand people are working in the base area, 237 of which are

LAYING GATHERING LINE from Grand Isle to production platforms in the Gulf of Mexico. Humble expects to have this 7-mile, 10½-in., Somatic-coated gathering system in service by July 1. Capacity will be 30,000 bbl. per day.

Humble employes and the others are contracting company personnel and related persons connected in some way with Humble's exploration and drilling program.

A modern camp is located on the base grounds. This contains 17 company houses, and 11 additional houses owned by various employes who built them on land which is owned by the company.

Drilling crews and supervisory personnel are transferred to and from the platform sites by helicopter. Humble uses one such eight-passenger aircraft which makes two trips daily, hauling drilling-crew changes from Grand Isle to various platforms in Timbalier Bay and other areas. Each LST tender ship (four are in use) and all platforms have been fitted out with helicopter decks. A smaller helicopter is used for "hot shot" service and as an emergency craft.

Offshore Strike Made

Stanotex discovers first producer off Texas coast since tidelands act; well located 23 miles from Corpus Christi

HOUSTON. — The first commercial oil discovery on the Texas Continental Shelf since the federal tidelands decision last year has been made by Standard Oil Co. of Texas 23 miles southeast of Corpus Christi.

The well, 53 State 948, drilled from an offshore platform by Kerr-McGee Oil Industries, Inc., in 38 ft. of water, produced clean oil on a 21-hour test at the rate of 214 bbl. daily through a 9/64-in. choke. Surface flowing pressure was 1,130 psi. and gravity of the crude was 39.5°. Gas-oil ratio was 467.

The well's production is coming from an upper Frio sand section at 7,760 ft. Total depth is 9,980 ft., 480 ft. deeper than contracted for. Testing is continuing.

New test planned . . . Standard of Texas holds a block of 18,000 acres in the area. The leases were acquired at the December 1, 1953, sale of tidelands properties. Another test will soon be drilled in the Sand Hills area, about 3 miles off Padre Island.

The discovery well, located in the Quail area, was drilled from a template-type platform about 1½ miles east of Padre Island, Kleberg County. The drilling platform can accommodate three more wells. It was fabricated by Brown & Root, Inc., Houston.

First try in Gulf . . . The discovery well was the first test started in open waters off Texas after Congress passed the Submerged Lands Act, and was Stanotex' first venture in the Gulf of Mexico.

Spudding the well was delayed 2 months by high winds that swamped a barge carrying a section of the drilling platform. The barge capsized in 65 ft. of water. Fishing and repairing the equipment required several weeks.

Kerr-McGee has been using a converted yard freighter as a tender ship for the platform.

Stanotex' offshore-drilling program along the Texas coast will be confined wholly within the state-owned areas of the Continental Shelf. The firm, a wholly owned subsidiary of Standard Oil Co. of California, has no leases on the outer Shelf.

Stanolind hole "tight" . . . Another hot spot along the Texas coast is on the outer Continental Shelf, where Stanolind Oil & Gas Co. is drilling a 13,000-ft. wildcat 25 miles east of Galveston, in water 50 ft. deep. The location is about 19 miles from the nearest land *(The Oil and Gas Journal, June 21, page 152).*

The well was last reported drilling at around 8,700 ft. No later reports have been issued. The operation is now considered a tight hole. Loffland Bros. of Tulsa is the contractor for this well, which is in tract L-141, OCS-0273 on federal land.

Louisiana well . . . Over the state line, off Cameron Parish, Louisiana, a 13,000-ft. wildcat test by a group of four companies, headed by Continental Oil Co., has passed original contract depth.

Conoco et al. A-1 State Lease 1,656, in West Cameron Block 192, about 30 miles from shore, was at total depth of 13,118 ft. in shale June 24. The operator attempted 18 sidewall cores and recovered 13, but no information was given on cores available.

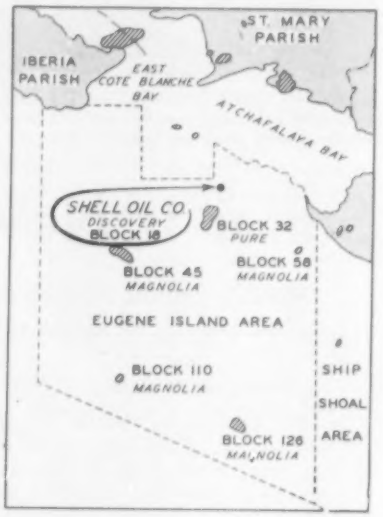
Freeport Refinery Planned

WASHINGTON. — Construction of a $16,194,000, 10,000-bbl. per day refinery by the Avtane Refining Co., Dallas, at Freeport, Tex., has been approved by the Office of Defense Mobilization.

Certificates for accelerated amortization of the project were issued by the ODM last week, providing 100 per cent quick writeoff of $7,150,000 for special equipment, 65 per cent of $5,145,000 for basic equipment, 40 per cent of $3,009,000 for auxiliary facilities; and 15 per cent of $390,000 for buildings. No amortization was granted on $500,000 for acquisition of land.

The refinery apparently will be a high-octane operation. The full write-off for the "special equipment" covers an alkylation unit.

William V. Bentley, Jr., Dallas, was listed as president of the company.



Shell Opens Field

New Eugene Island well 4 miles off St. Mary Parish

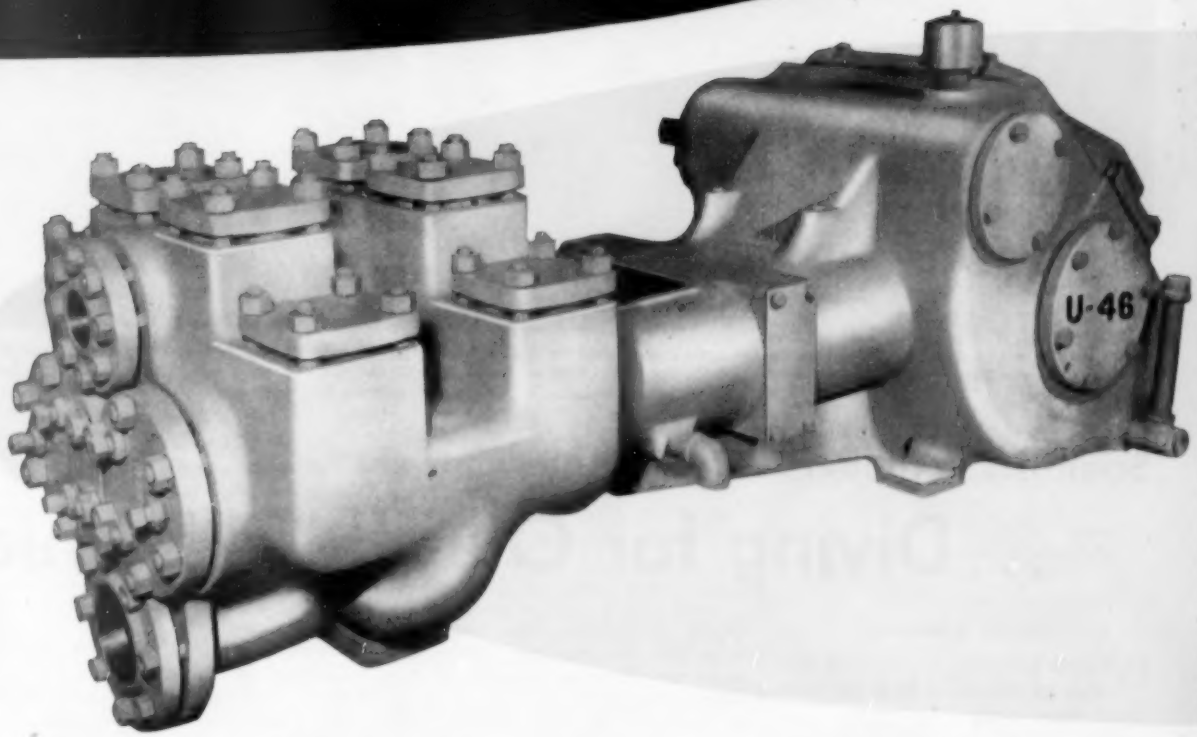
FRANKLIN, La.—Shell Oil Co. is opening another Gulf of Mexico oil field 4 miles off the coast of St. Mary Parish, Louisiana, in Block 18, Eugene Island area.

Its discovery well, on State Lease 1667, flowed at the rate of 440 bbl. of 36.3°-gravity clean oil per day on tests through 11/64-in. choke. Flowing pressure gaged 1,625 psi. with gas-oil ratio of 792 cu. ft. per barrel.

Production is from Miocene sand, perforated at 9,362-70 ft. Hole was drilled to 11,525 ft. and plugged back to 9,380 ft.

Location is 4 miles northeast of Pure Oil Co.'s Eugene Island Block 32 field, discovered in 1949.

You've Never Seen Such a Versatile Pump!



Bethlehem's U-46 is a small pump, but what a busy one! It's intended for general utility work, and we think it's the most versatile unit ever offered for this service.

The U-46 is a horizontal, duplex, double-acting pump with 4-in. maximum liner bore and 6-in. stroke. When used for conventional jobs, such as fresh-water pumping around the rig, it is furnished with alloy cast-iron liners. For handling salt water and other corrosive fluids, bronze liners, piston rods, valves, and valve seats are furnished. All-aluminum-bronze fluid end and accessories are also available. Moreover, fluid-end parts of correct materials can be supplied for oil and drilling-fluid service.

You'll find that your Bethlehem U-46 will seldom be idle. It is as much at home around the lease on gathering work as it is on the rig. This is a handy little unit that fits in anywhere, without fuss or bother. It's so easy to move that setting it up in a new location is never a problem.

The U-46 can be used with any type of prime mover—electric motor, gas or gasoline engine, etc. For further details and specifications, check with the nearest Bethlehem Supply office or store.

In addition to drilling-rig equipment and a full range of pumping units, Bethlehem offers Beth-Co-Weld line pipe, Purple Strand wire rope, and a complete variety of sucker rods, fasteners, etc. Ask for these products when you are next equipping your oil-country installations.

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BETHLEHEM STEEL

GOING DOWN to 120 ft. off the California coast, these geologists are seeking clues to oil-bearing structures. Many seeps have been found, structures mapped, and faults traced by work.

UNDERWATER PHOTOGRAPH shows geologist using magnetic compass; in other hand he holds inclinometer to measure dip of outcrop.

Scientists in rubber suits and Aqualungs are . . .

. . . Diving for Oil off California

Ted A. Armstrong

DIVING geologists are studying outcrops on the ocean floor off California these days.

With inclinometers, sealed compasses, the traditional geologist's hammer, and a minimum of other equipment, these scientists are going as deep as 130 ft. to perform surface-geology work for their oil-company clients.

Are the results really worth the effort and expense? Dr. Robert S. Dietz answers with an emphatic "Yes!" "We have had remarkable success in mapping offshore structures by strike and dip and have succeeded in tracing some offshore faults."

Dietz, who holds a Ph.D. in geology, is one of six partners in Geological Diving Consultants, San Diego. Although they have been organized only since last October, the group already has done offshore geology for six oil companies. To date, they have worked an area extending from San Diego to Point Conception, 300 miles up the coast.

"We visualize working into the indefinite future," Dietz says. "Since we started we have had all the work we can handle by fielding two teams each week end that weather permits." Already the diving scientists have found many oil seeps. Most are small, but one heavy-oil seep discovered rivals the extensive La Brea tar pits in size.

What's involved . . . Much of the work of the underwater geologists—or geological oceanographers, as they call themselves—is in areas where seismic information is confusing. Here the divers seek to clear up the problems by tramping the ocean floor in search of geologic clues to the structure being mapped.

Since the Continental Shelf off California dips sharply, their operations are confined to a seaward distance of 3 or 4 miles. An exception is the area around San Pedro, where the shelf is much wider.

It is generally felt that large pools of oil lie under the shelf waters waiting to be tapped. As Dietz puts it: "Major oil discoveries, as well as important extensions of upland fields, are sure to be made," and he and his partners feel that their underwater work will, at least in part, be responsible for some of them.

Diving equipment . . . When fully togged out for mixing with the fish, seaweed and other life in the Pacific, this new breed of geologist resembles the comic-book man from Mars.

The diver wears a specially made exposure suit of neoprene foam rubber. It's a "wet" suit, designed not to keep the water out but to keep the diver warm, since much of the work is done in depths where the water is colder than 54° F.

Air is provided by an Aqualung, a high-pressure air cylinder with a regulating valve and a mouthpiece through which the diver breathes. A face mask for visibility, flippers for swimming speed and to protect the feet on bottom, gloves, and only the essential equipment for the job at hand complete the uniform.

The steel or aluminum cylinders hold air at 1,800 to 2,250 psi. Each has a capacity of about 70 cu. ft. of air, permitting the diver to remain submerged from 11 to 50 minutes, depending largely upon the depth at which he is operating. Use of twin tanks greatly increases the limit.

Other equipment . . . All tools and instruments for underwater geology

FOSSIL ELEPHANT TEETH recovered from a Pleistocene outcrop on the sea floor off California. In hand of R. S. Dietz, left, is a portion of the tusk. At right is R. F. Dill. Both are members of the new company, Geological Diving Consultants. (San Diego Union photo by Henry Kierstead).

must be simple to operate, since the diver is faced with several handicaps. Light is poor, the diver's hands are quickly numbed by water colder than 60° F., and since his weight is largely neutralized, he is easily pushed around by water currents.

Principal tools for the sea-bottom geologists are a simple inclinometer for measuring dips and slopes, a sediment sampler for taking the top 12 in. of undisturbed sediments on the ocean floor, and a watertight compass, stop watch, exposure meter, and camera.

Working dives . . . Divers usually work in pairs, operating from an anchored boat. The descent is made by free swimming or by climbing down the anchor chain. Tools are carried in a gunny sack, stuck in the belt, or lowered on a line after the diver is on bottom.

When a diver surfaces, he dictates notes on his findings and is questioned on further details by another geologist. Samples are identified for future study and reference.

The length of a dive is determined largely by the depth of the water, and amount of physical effort involved.

Most important factor is depth, for several reasons. The deeper the water, the colder it is. And as the temperature drops, so does the efficiency of the diver. Below 60° F., divers become extremely cold and their power of concentration declines rapidly after 30 minutes.

Also, operations at 130 ft. for more than 15 minutes require a period of decompression during the ascent, and because of air requirements, shorten the working time on bottom. Heavy physical work will greatly shorten working time, since it multiplies by 3 or 4 the amount of air required.

The partners usually average about 10 two-man dives per day, and the average time in the water per man is about 2 hours. For diving below 100 ft. compression problems limit the teams to about 40 minutes of ocean-bottom work per man per day.

Background . . . The consulting firm was formed, Dietz says, "when it became apparent that there was an urgent need for this type of service along this coast."

All members of the firm have other jobs and do their diving on week ends. Besides Dietz, members are Robert F. Dill, Edwin L. Hamilton, Henry W. Menard, David G. Moore, and George Shumway. Three hold doctorates and the other three master's degrees. All are marine geologists by profession, and all are associated either with the Naval Electronics Laboratory or the Scripps Institution of Oceanography.

They learned their diving through a course given at Scripps. Since then, Dietz says, they have developed several new techniques for locating rock outcrops and have added greatly to the store of knowledge of speedy and safe diving.

Already the group has made more than 1,000 dives without an accident or, as Dietz adds, "a near accident."

Even though they now have as much or more work than they can get done, the diving geologists are thinking of other fields.

"We have never worked in the Gulf Coast," Dietz says, "but we could probably field a team in that region if we should get sufficient inducement."

Richfield Bids High

LOS ANGELES. — Richfield Oil Corp. evidently will be awarded a state lease on 1,175 acres of lands offshore from Rincon field northwest of Ventura.

When bids were opened in the State Lands Commission office here last week, Richfield's royalty offer was more than twice that offered by other bidders. Richfield made two bids, offering royalty factors of 5.1575 and 5.2375. Applied to the commission formula used in establishing royalty rates, this would mean 78 per cent royalty for a well producing 100 bbl. daily.

Lowest offer submitted was that of Western Gulf Oil Corp. with 1.33. Standard Oil Co. of California offered 2.012; General Petroleum - Humble-Honolulu group, 1.666; Signal Oil & Gas Co., 1.8261; and Continental-Union-Shell-Superior group, 2.03.

Union to Build Pipelines

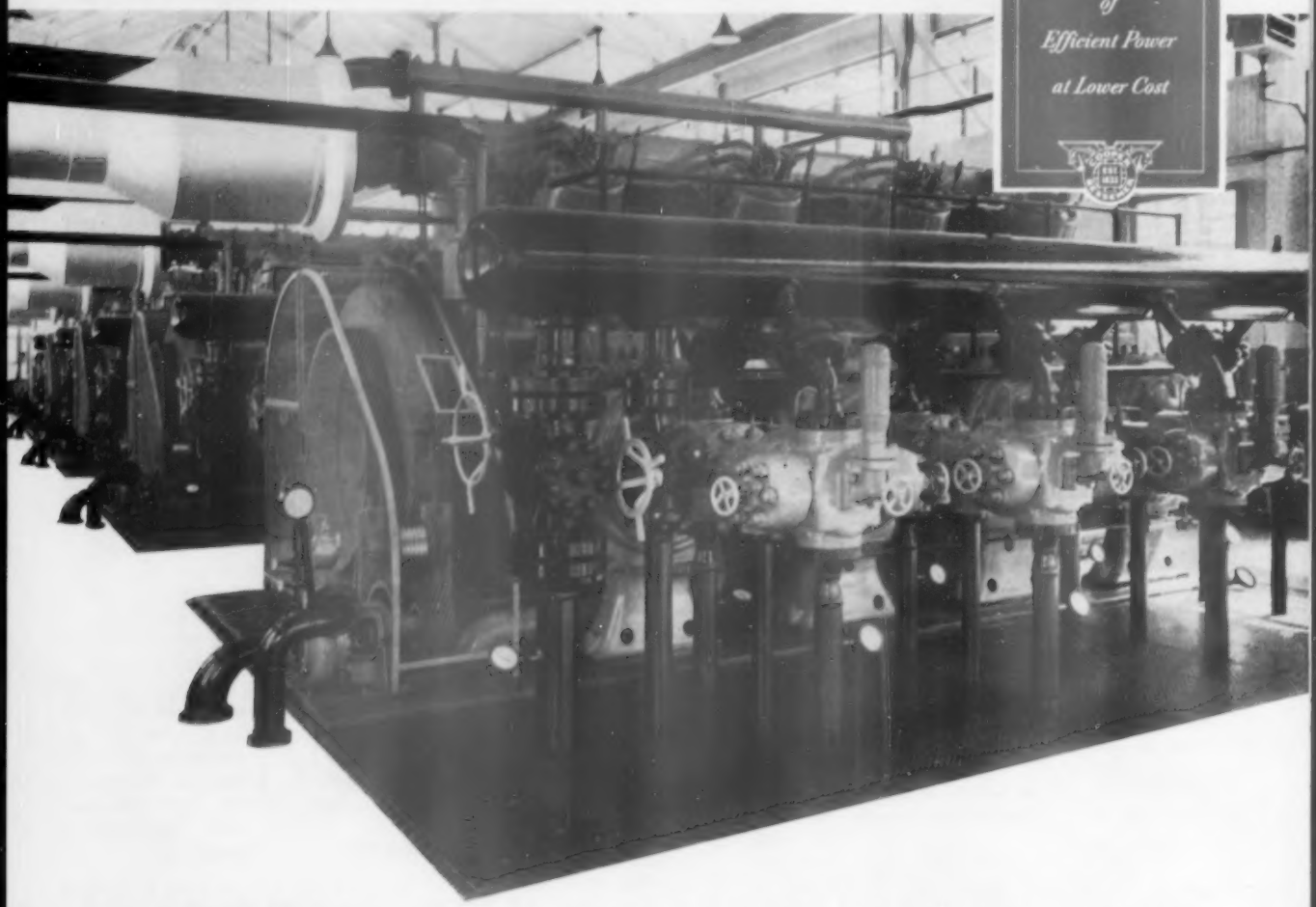
LOS ANGELES.—Union Oil Co. will build several crude and products pipelines from its Los Angeles and Oleum refineries.

In a recent address, Reese Taylor, president, said franchises are being obtained for construction of a line from the Torrey Canyon field near Santa Paula to the Wilmington refinery. This line, some 70 miles in length, would eliminate the haul by tanker from the company's submarine terminal near Ventura.

In the Santa Maria area where Union soon will start constructing a 20,000-bbl. coking unit, several projects are planned. One will be a 5-mile, 10-in. crude line from Summit station to the plant site. Products from the coker will be delivered to the Avila tanker loading terminal through an 8-in., 18-mile line. A 7-mile crude line from the plant to Guadalupe field also is being considered. Such a line would be paralleled by one for delivering cutter stock to the field so that the heavy crude could be diluted prior to shipment.

Cooper-Bessemer double deck valves permit previously unheard of pressure flexibility in this GMV installation at Coco, West Virginia.

Another Example of Efficient Power at Lower Cost



A new high in FLEXIBILITY FOR UNDERGROUND STORAGE . . . with COOPER-BESSEMER GMV'S

Because of their unsurpassed flexibility, Cooper-Bessemer compressors were recently selected by The United Fuel Gas Company to pump gas over the wide range of pressures required by an underground storage station.

The Coco Compressor Station, located at Coco, West Virginia and powered by five 880 hp Cooper-Bessemer Model GMV-8-TF compressor units, is one of the larger storage stations in the country. Each GMV is equipped with four 7" diameter compressor cylinders having a working pressure of 2,000 psi. The GMV's operate against the following variable pressure conditions:

Pumping to Storage

Suction Pressure: 740-850 psig
Discharge Pressure: 900-1900 psig

Pumping from Storage

Suction Pressure: 400-750 psig
Discharge Pressure: 800-900 psig

An important part of this previously unheard of flexibility, available with Cooper-Bessemer compressors, is obtained by using double deck valves. A valve cap unloader replaces the usual flat valve cap. In addition, a bottle type unloader is installed in the outer head of each compressor cylinder. This means twenty unloaders per unit, thus twenty possible unloading steps to handle each pressure condition.

For efficient operation under varying conditions of gas pressure and volume, for compactness, long service life, and low maintenance, you will find Cooper-Bessemer offers the best in dependable low-cost compressor service.

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World Output Skids

U. S. gain of 108,200 bbl. daily more than offset by sharp drop in production in Saudi Arabia, Kuwait, and Venezuela

Dahl M. Duff

LOWER output in Saudi Arabia, Venezuela, and Kuwait caused a decline of nearly 74,000 bbl. daily in Free World crude-oil production in April.

The April producing rate of 12,290,100 bbl. daily in the non-Communist countries of the world compared with the record high level of 12,363,700 bbl. daily reached in March.

United States production gained 108,200 bbl. daily to average 6,614,700 bbl. daily in April. This was the highest domestic crude production since the all-time record of 6,633,700 bbl. daily in December 1952.

More than offsetting this expanded United States output were the sharp reductions in several important oil countries abroad. Total production for the non-Communist countries abroad was 5,675,400 bbl. daily, 181,800 bbl. daily, or 3.1 per cent below the total for these countries in March.

For the first 4 months of 1954, total Free World production averaged 12,154,000 bbl. daily. This represented an increase of 465,000 bbl. daily, or 4.0 per cent, over the average for the same 4 months of 1953.

CRUDE-OIL PRODUCTION
(Daily average in thousands of barrels)

Country—	April 1954	March 1954	April 1953
W. Hemisphere:			
Argentina	83.0	85.0	77.7
Bolivia	3.4	5.0	1.4
Brazil	2.1	2.1	2.7
Canada	184.0	199.8	179.7
Chile	4.5	4.6	3.2
Colombia	113.6	113.5	112.8
Cuba	0.1	0.1	0.1
Ecuador	8.5	8.4	8.0
Mexico	222.0	225.0	201.5
Peru	47.1	48.3	41.7
Trinidad	63.8	63.6	61.7
Venezuela	1,829.2	1,872.0	1,744.6
Total	2,561.3	2,627.4	2,435.1
W. Europe and Africa:			
Algeria	1.7	1.7	1.9
France	7.4	7.3	7.3
Fr. Morocco	2.5	2.5	2.1
W. Germany	49.6	48.9	40.9
Italy	1.6	1.6	1.9
Netherlands	17.5	16.1	16.3
Egypt	38.5	39.3	47.7
United Kingdom	1.2	1.2	1.1
Total	120.0	118.6	119.2
Middle East:			
Bahrain	30.1	30.1	30.0
Iran	47.9	45.0	24.2
Iraq	606.5	595.8	568.9
Kuwait	900.4	1,012.2	858.0
Neutral Zone	4.0	6.9	
Qatar	97.8	98.8	85.7
Saudi Arabia	954.6	978.3	859.5
Turkey	0.7	0.5	0.5
Total	2,642.0	2,767.6	2,426.8
Other Asia:			
British Borneo	102.0	102.0	94.9
Burma	3.5	3.5	2.5
India	6.8	6.8	6.0
Indonesia	220.0	215.0	203.8
Japan	5.7	5.9	4.5
New Guinea	12.1	8.4	4.9
Pakistan	2.0	2.0	3.9
Total	352.1	343.6	320.5
Total, non-Communist foreign	5,675.4	5,857.2	5,301.6
United States	6,614.7	6,506.5	6,446.3
Total Free World	12,290.1	12,363.7	11,747.9
Est. Russia & E. Europe:			
Russian Zone, Austria	62.0	62.0	60.0
Romania	110.0	110.0	90.0
Russia	1,110.0	1,110.0	1,035.0
Other Communist	34.1	34.1	31.2
Total	1,316.1	1,316.1	1,216.2
World total	13,606.2	13,679.8	12,964.1

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these regions. Estimates also have been made for certain other countries, particularly in Southeast Asia, for which completely current reports are lacking. Iranian production shown is net output, the gross less recycled material. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

TREND OVER THE LAST YEAR

	W. Hemisphere less U.S.	Middle East	Total non-Communist foreign
1953—			
May	2,423.1	2,523.7	5,391.0
June	2,459.4	2,536.0	5,450.1
July	2,487.7	2,534.0	5,471.9
August	2,443.3	2,489.0	5,387.3
September	2,485.7	2,416.4	5,345.3
October	2,519.5	2,528.1	5,511.5
November	2,651.9	2,341.7	5,461.6
December	2,711.9	2,540.2	5,714.1
1954—			
January	2,682.8	2,491.2	5,636.4
February	2,703.7	2,550.6	5,695.3
March	2,627.4	2,767.6	5,857.2
April	2,561.3	2,642.0	5,675.4

Kuwait drops . . . Among the foreign producing countries, the largest decline was in Kuwait which fell back sharply from the record level attained in March. April production averaged 900,400 bbl. daily, down nearly 112,000 bbl. daily from the previous month.

Saudi Arabian output dropped back 23,700 bbl. daily to 954,600 bbl. daily in April. Iraq showed a small gain of 10,700 bbl. daily. Of the individual producing areas in Iraq, Zubair field, operated by Basrah Petroleum Co., Ltd., climbed to a new record of 90,400 bbl. daily in April. Qatar dropped back slightly from its record 98,800 bbl. daily in March.

Production for the entire Middle East declined 125,600 bbl. daily, or 4.5 per cent, from the all-time high of 2,767,600 bbl. daily in March. For the first 4 months of 1954, Middle East production averaged 2,613,000 bbl. daily. This compares to an average of slightly more than 2,425,000 bbl. daily for all of 1953.

Production developments of interest included completion of a new pipeline bringing two new fields in commercial operation in western, or Netherlands, New Guinea. The new 47-mile line, mostly 8-in., moves crude from Wasian and Mogoi fields to a tanker terminal. For the last 6 years, New Guinea's production has been steadily averaging about 4,800 bbl. daily, the limit of the line moving crude from Klamono field. The new line will permit production of an additional approximately 15,000 bbl. daily from the concession. The operating company is affiliated with Royal Dutch-Shell, Standard-Vacuum, and Caltex.

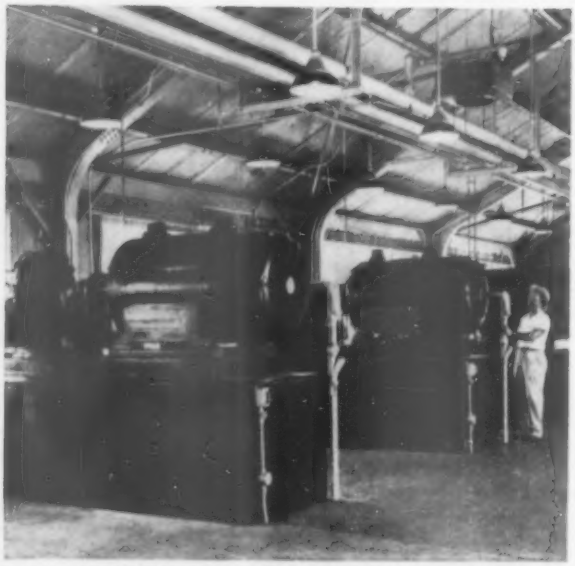
In Europe, Western Germany's production showed another slight gain to reach an average just under 50,000 bbl. daily. French production continues limited largely to Lacq field, but if hopes for the new Esso discovery southwest of Bordeaux are realized, output should begin to increase rapidly later this year.

ENGINEERING REPORTS:

COMPACT, CENTRALIZED CONTROL PANEL handles high-voltage distribution economically for the entire Eagle Point Refinery operation. Incoming power from both plant generators is distributed to transformer banks, G-E limitamp control and switchgear. Interlocks assure safer operation, proper sequence. All enclosures are metal-clad for maximum protection.

G-E equipment helps Eagle Point

SIMPLE, FLEXIBLE DRIVE CONTROL for power station auxiliaries is provided by this G-E Limitamp panel. It protects motors for service pumps, raw water pumps, air supply apparatus.



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boost output 50% over rated capacity

20,000 barrels a day increase at Texaco's Westville, N.J. refinery aided by co-ordinated General Electric equipment

The Texas Company's Eagle Point Refinery in Westville, N. J. recently hit a production high when it boosted its output 50 per cent over rated capacity. General Electric equipment helped in this production increase—approximately 20,000 barrels of crude throughput a day.

Eagle Point is another of this country's top refineries to use co-ordinated G-E equipment and engineering services. G-E engineers, specializing in refinery applications, helped the Texas Company plan the electrical system, which includes provisions for future plant expansion. High-voltage distribution is one of the system's key features—power is transmitted to substations at 13,800 volts, reducing losses and improving voltage regulation.

If you are planning to build, expand, or modernize, let a team of G-E engineers help you design an electrical system for top production and flexibility. Contact your nearby G-E Apparatus Sales Office early—during the preliminary planning. General Electric Company, Schenectady 5, N. Y. 661-43

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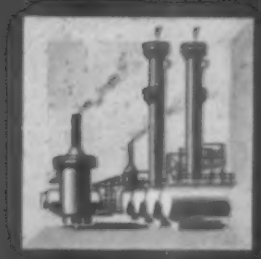

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The decline in Egyptian production compared with a year ago is due to the depletion of one of the Sinai fields, a development which had been long forecast.

The two largest oil countries in the Western Hemisphere—aside from the United States—both showed output drops in April. Venezuela was down 42,800 bbl. daily to 1,829,200 bbl. Venezuelan production hit a record last December of 1,935,200 bbl. daily and fell back steadily in each of the succeeding 4 months. This trend is partly due to seasonal considerations affecting consumption of Venezuelan heavy fuel oil.

Canadian production also was down in April. Average output fell almost 16,000 bbl. daily. Colombian production showed little change. With condensate, April output amounted to 116,825 bbl. daily, crude only averaging 113,601 bbl. daily. Bolivian output declined in April from the high levels of the preceding few months.

PARENTIS DISCOVERY WELL of Esso Standard in southwestern France.

Esso Seeks Expansion

French Government gets Esso bid for exploration rights over 4,000,000 more acres adjoining Parentis discovery

ESSO STANDARD, S.A.F., has applied for exploration rights over 4,000,000 acres adjoining its concession in southwestern France where the company recently made an apparent major oil discovery.

If granted by the French Government, the new area would approximately double the company's acreage in the Aquitaine Basin which extends over this part of France. Esso Standard also has asked for exploitation rights in the immediate area of its Parentis discovery in the Landes section about 44 miles southwest of Bordeaux.

The company has moved speedily to confirm the discovery with additional wells. Nos. 2 and 3 are now around 6,000 ft. and expected to reach the top of the section at about 7,400 ft. The No. 2 well is being drilled (3,940 ft.) southwest by the French contractor, Societe Forex, which drilled the discovery.

Parentis 3 is under way the same distance to the west. This well is being drilled under contract to Esso by the French oil company, Soc. Nationale des Petroles du Languedoc Mediterraneen. Another location has been staked, and equipment is being moved in for Parentis 4, north of the discovery. Arrangements have been made for the drilling of this well by another French company, Soc. Nationale des Petroles Aquitaine.

Discovery well . . . The Parentis discovery was finally bottomed at 7,867 ft., still in limestone believed to be of Jurassic age. Circulation was lost after the bit dropped a short distance at this depth. Water had not been reached at the final depth.

Earlier the well tested 2,685 bbl. daily on ½-in. choke and 1,100 bbl. daily on ¼-in. in the interval between 7,415-31 ft. *(The Oil and Gas Journal, April 26, page 129).* The Lower Cretaceous limestone was topped at 7,281 ft. The crude is of 32.46° gravity A.P.I. and has a sulfur content of 0.39 per cent. Seismograph work shows the Parentis structure to be an east-west anticline with the discovery well on the eastern end of the crest.

Reports from France said the company plans to produce between 945 and 1,070 bbl. daily until all tests have been completed and other outlets provided. Three storage tanks with a combined capacity of about 19,000 bbl. have been completed, and a 6-in. line is being laid to move the crude to the Parentis railroad system.

Esso Standard has made location for another wildcat test on a structure located about 31 miles northeast of Bordeaux near the village of Carcas adjoining Lake Lacanau. The company is using three seismograph parties in the concession area, and has completed a large amount of gravity work.

Esso Standard is owned 63.2 per cent by Standard Oil (N. J.) and 18.35 per cent by Gulf Oil Corp. The remaining 18.45 per cent is held by other investors, and some of this stock is traded on the Paris exchange. The company's concession was obtained in February 1951. Under its terms, the French Government can buy 10 per cent of the shares of the exploitation company to be formed. The concession term is 15 years, with the company nominating half the acreage to be relinquished at end of each 5-year period.

Iranian Picture Brighter

Representatives of the eight-company international oil consortium are making good progress in their negotiations with Iranian Government officials, and an agreement in principle is expected by mid-July.

From both sides last week came predictions that this goal would be met provided no unforeseen hitches develop. Once the agreement in principle is initiated, lawyers will take over to prepare a detailed document which, on the Iranian side, will be submitted to the Majlis, or lower house of parliament, for ratification.

The compensation question loomed as a possible stumbling block in the settlement timetable. This problem was being threshed out in separate negotiations between Iranian and British Government experts. A British official said no general agreement was possible

SANDFRAC SERVICE USED TO INCREASE PRODUCTION FROM LOW-SOLUBILITY FORMATIONS

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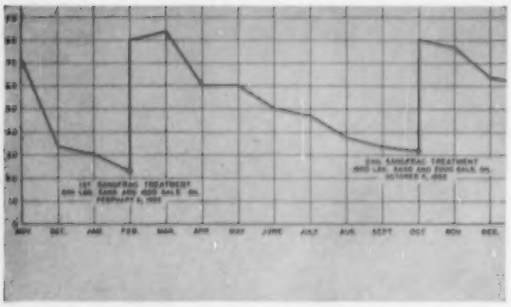

Old producers as well as new completions have been successfully fractured with Sandfrac. This chart illustrates its effectiveness. Note especially that both treatments resulted in greater production than when the well was first completed. Payout time was less than five days on the first job . . . less than six days on the second.

Dowell designs and builds its own pumping and mixing equipment to assure you the most effective Sandfrac service. Shown here is a late model diesel pump unit, constructed especially for use in well fracturing services.

Sandfrac* service is designed to increase oil production from both old and new wells. It has resulted in higher recovery rates and a boost in total recoverable reserves from hundreds of leases.

A Sandfrac treatment basically involves the displacing of oil and sand into a producing formation. And, after the fracturing oil returns to the well bore, the sand remains in the formation to act as a propping agent in existing and newly created fractures. Thus, the effective drainage area of the well is increased.

The sands used in Sandfrac treatments are carefully selected and are mixed in the oil, using specially designed mixing equipment. The grain size and the quantity of sand used can be varied to meet your specific well conditions. A recent trend in the use of sand, for example, calls for batch treatments—a fine-grained sand followed by a coarse-grained sand.** The fine sand helps to prepare the formation for the coarse one which follows. This method helps to eliminate sand screen-outs which can occur in treatment of some dense, tight pay zones.

The fracturing materials used to support and carry the sand are special, refined oils of medium gravity. These oils are carefully selected for their sand-suspension characteristics and pumpability. They may be resold by the operator following the treatment.

Sandfrac is economical, fast and requires no special well equipment or shut-in time.

Dowell engineers bring all materials, along with high-pressure pumping equipment, right to your well. They perform the job for you—their experience on thousands of these jobs benefits you.

Sandfrac is an adaptable service. It can be used both to complete and to retreat wells. It provides many advantages for the operator—each one designed for profitable results! It has been *proved in use* many times in a variety of formations. Why not look into this low-cost fracturing service? For full details on Sandfrac, call the Dowell station or office nearest you. Or, if you prefer, write directly to Tulsa, Department G-11.

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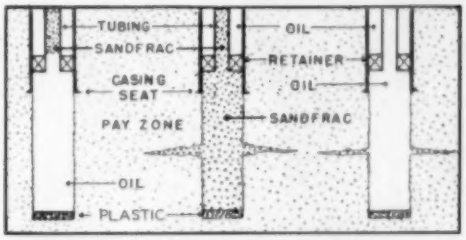

APPLICATION OF SANDFRAC

Sandfrac is customarily applied under a packer or retainer. However, when well conditions and equipment permit, treatments can be made down the casing with or without tubing and rods in place.

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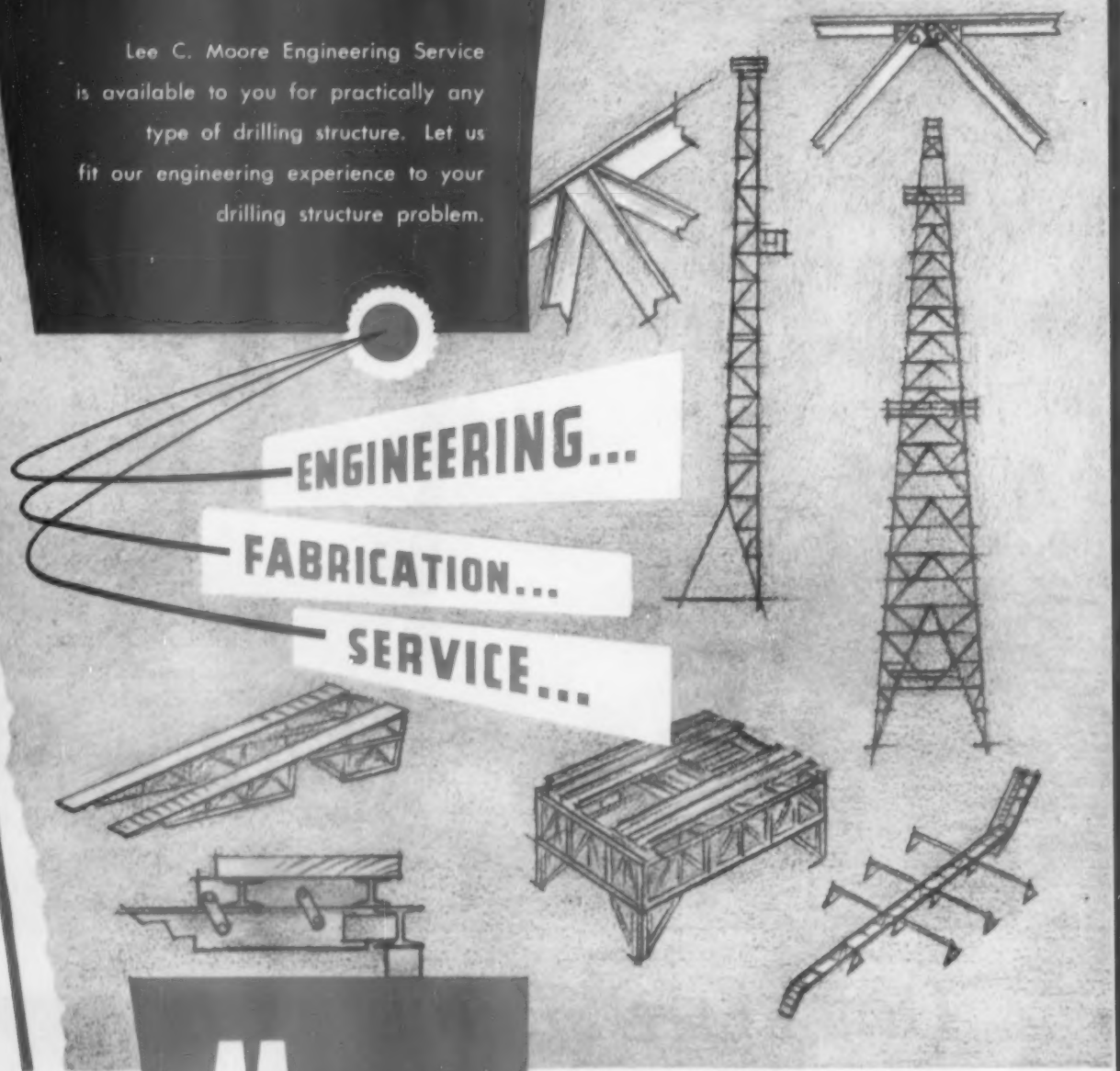

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without settlement of the vital compensation issue.

It appeared that an extremely complicated corporate organization would be established to operate the oil properties. This would make possible an agreement on the form of management, the issue on which the negotiations were broken off in mid-May.

Exploration Readied

Parties make final plans for Egyptian desert hunt

EXPLORATION parties and equipment are being moved into Egypt in preparation for the program about to be launched by Egyptian American Oil Co. in the Western Desert.

A Robert H. Ray seismograph party is scheduled to leave Houston by chartered aircraft early in July. This same organization will provide two double-gravity-meter parties. A second seismograph party is being furnished by Seismograph Service Corp.

The Ray party is due to work in the eastern section of the coastal part of the 80,000-square mile concession, and the SSC party in the western section of the coast. The gravity-meter groups will range over the entire area. By early September, it is planned to have four surface geological parties in the field. In addition, an aerial photography and later photogeological study of the concession is being arranged.

Staff for the operation is now being filled out. Don Eicher, formerly with Arabian American Oil Co., is chief geologist; James S. Royds, formerly division geologist in the Rocky Mountains for Continental Oil Co., will be exploration manager. Chief geophysicist will be Robert Bixby, formerly with Hudson's Bay Oil & Gas Co. R. W. Blair is chief surface geologist.

Office established . . . The company has established executives offices in Cairo where W. F. Penniman, formerly with Conorada Petroleum Corp., is financial and public-relations adviser. The Western Desert concession was obtained by Conorada early last February and will be operated with the participation of two of Conorada's parent companies, Conoco and Ohio Oil Co., each holding 27½ per cent, together with Cities Service Co., and Richfield Oil Corp., each holding 22½ per cent. Continental will be in charge of operations through Egyptian American.

A concession over about 14,000 square miles was obtained about 2 months ago by Cities Service on behalf of itself and Richfield. This area adjoins the Western Desert concession to the east. Discussions are under way as to lumping this area in with the Western Desert operation.

Jungle Swamps Make Exploration Hazardous

Some of the world's worst swamp and jungle country has been encountered in the exploratory program being carried out in Papua in southeastern New Guinea. The operating companies, Australasian Petroleum Co., Ltd., and Island Exploration Co., Ltd., are owned by Anglo-Iranian Oil Co., Ltd., Standard-Vacuum Oil Co., and Australian interests. Transportation equipment in use includes three helicopters to move personnel and light materials. Shown here is a geophone station established in a grass swamp.

New Show in Australia

West Australia's Rough Range No. 1 well—a wildcat that touched off oil fever in Australia late last year—has come up with a second show of oil at 9,789 ft.

West Australian Petroleum Pty., Ltd., jointly owned by Caltex and the Australian Ampol Exploration, Ltd., announced shows of oil were discovered in the drilling mud stream. Mechanical conditions of the hole have prohibited formation tests, but such tests will be attempted when conditions are right.

Rough Range No. 1 was spudded September 5, 1953, near Exmouth Gulf on Australia's west coast some 600 miles north of Perth. Oil shows were noted at 3,605-3,620 ft. in late November and a test in early December determined a flow of around 550 bbl. daily of light crude *(The Oil and Gas Journal, December 29, 1953, page 60)*.

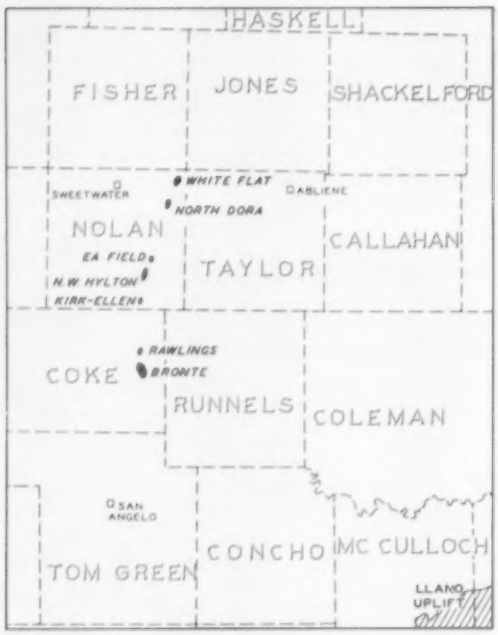
Drilling and exploration has been greatly accelerated since the November discovery, which was Australia's first apparent commercial oil production.

Another development of interest in connection with Australian exploration was the announcement that Frank A. Morgan, since 1937 vice president and chief geologist of Richfield Oil Corp., had joined the Ampol company as chief geologist. Morgan originally recommended drilling in the Rough Range area in 1947 after studying its prospects. His report is credited with creating the interest that led to the discovery last November.

International Briefs

Anglo-Iranian Oil Co., Ltd., has scheduled two tankers to arrive at Aden the third week in July to allow commencement of initial operations in its new 120,000 bbl. daily refinery. The 12,420-ton British Duke will bring fuel oil for firing the furnaces, and the British Patriot, of 12,120 tons, will carry the first cargo of crude oil from the Middle East to the new refinery. The refinery will come on stream in August, about 4 months ahead of the original schedule.

Ashdown No. 1, being drilled near Crowborough Warren, Crowborough, Sussex, in England, by D'Arcy Exploration Co. for the British Gas Council, has had shows of gas at 831 ft. The gas shows were from the Purbeck limestone, but it was not yet determined if they indicate commercial production. The area near Ashdown has some gas seepages and is considered one of the most likely prospects in southern England for gas production.



Here's the objective . . . and here is scene of search

Cambrian Has the Stage in West Texas

This porous and permeable sand now primary objective for wildcats

by Norman S. Morrisey

SEVEN fields are now producing from Cambrian rocks in West Central Texas. This zone was discovered in June 1953 at White Flat field, Nolan County. Already the pools cover a belt 50 miles long that extends south into Coke County.

Cambrian pays are the Wilberns dolomite and the Hickory (?) sandstone and wells have cored up to 142 ft. of porous and permeable sandstone. Very optimistic reserve estimates are forecast from this zone.

As a result of the indicated prolific pay sands, acreage is at a premium with prices of $50 per acre in rank wildcat territory. Along the known producing trend prices have skyrocketed. Humble Oil & Refining Co. is reported to have paid $1,002 per acre plus a ⅜ royalty payment (instead of the usual ⅛) and a well commitment for 160 acres offsetting the Kilroy 1-A Roberts, discovery well in the E. A. field.

Wildcatting in Coke and Nolan counties is up 33 per cent over the same period in 1953. During the first 5 months of 1954 there have been 48 wildcats with 6 producers and 42 dry holes.

Formerly the Ellenburger was considered the lowest potential pay horizon but today all deep tests are drilled to the Cambrian (Fig. 1).

Consensus is that the present producing fields in eastern Coke and Nolan counties will cover relatively small areas (300-500 acres) but that the Cambrian is a worth-while primary objective because of its apparent high reserves, thick pay sections, depth to production of only 6,000 ft., and high initial production. In North Dora pool, Skelly Oil Co. 3-B Boyd was completed for an initial potential of 1,987 bbl. of oil per day of 47°-gravity crude after logging 125 ft. of oil-stained Cambrian sand.

Reserves . . . Thickness of the pay sand in all fields is highly variable because of erosion, distance above the oil-water contact, and changes in lithology due to secondary dolomitization. As a consequence, reserves are hard to evaluate and no blanket statement can be made that applies to all Cambrian sand wells.

Cambrian fields may have an active water drive rather than a gas or gas in solution. This fact has not been clearly established, but is indicated by drill-stem-test information, fairly low gas-oil ratios, and small or nonexistent gas caps in the fields.

Geology

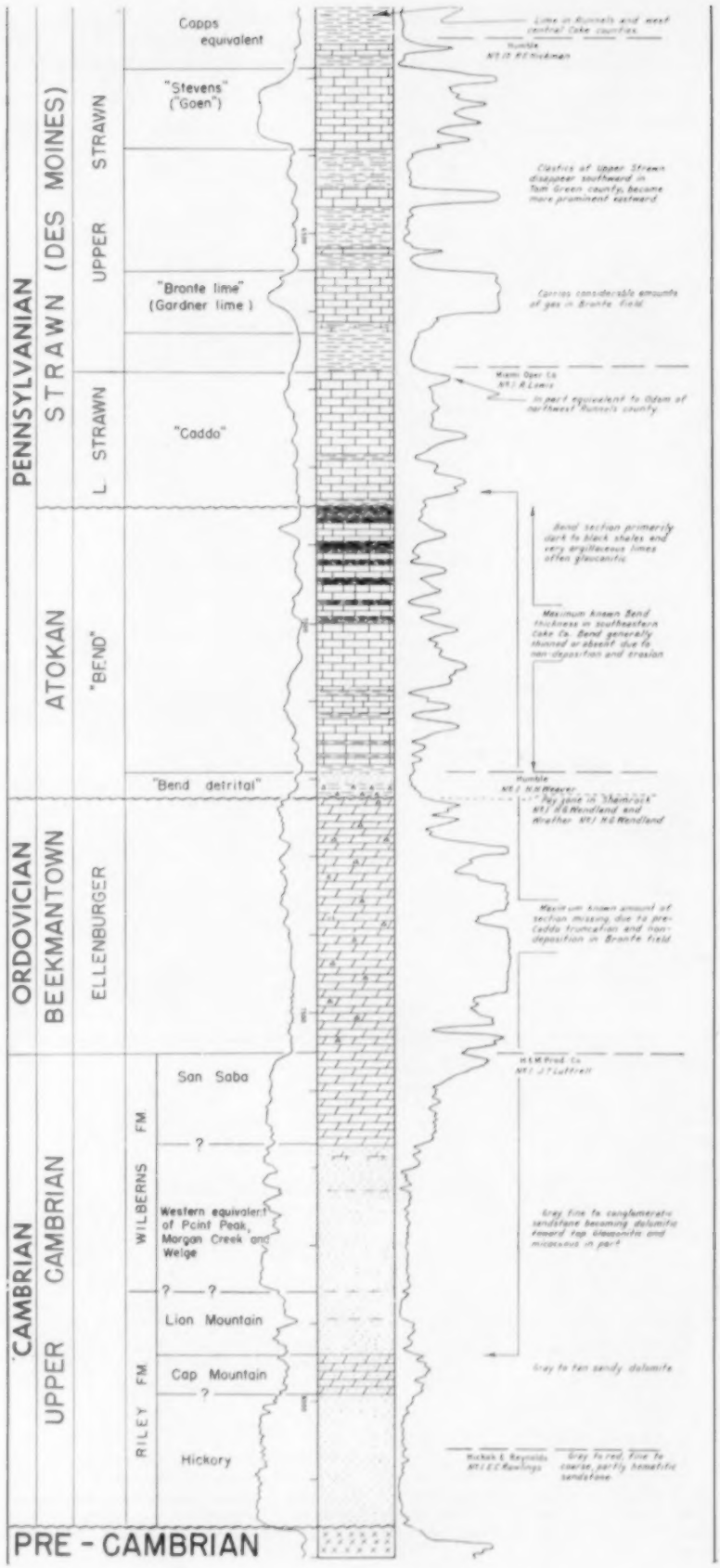
Cambrian production to date lies in eastern Coke and Nolan counties along a positive trend that extends for over 50 miles in a north-south direction on the west flank of the Bend arch. Subsurface information indicates that these fields form a series of sharply folded pre-Pennsylvanian anticlines that are closely associated with a north-south zone of faulting.

Inspection of the seven Cambrian producing structures shows that these fields are closely related geologically and each has the following similar features (Fig. 2):

1. Sharply folded north-south-trending Cambrian anticline, usually with a major fault on the east side of the field, parallel to the axial crest and upthrown on the west side.

2. Low relief structure in the overlying Pennsylvanian beds.

3. Deep pre-Pennsylvanian erosion with 300-1,000 ft. of Ellenburger and



Cambrian sediments removed (some geologists think this may be due in part to nondeposition).

4. Ellenburger missing or very thin over crest of stucture.

5. Oil - water contact in the pre-Pennsylvanian beds between —3,600 and —3,700 ft.

Detailed examination of these oil fields, however, reveals marked differences in lithology, faulting, and reservoir performance.

Exploration

Core-hole programs supplemented by other geophysical surveys are the most successful methods for delineating wildcat prospects. Unfortunately, however, these surveys map only the Permian or Pennsylvanian structure and do not give an accurate picture at Cambrian level.

Hylton and Bronte were located on the basis of core-hole work; seismograph work led to the discovery of Rawlings.

Seismic work is hampered by the Cretaceous cover in much of Coke and Nolan counties. In addition, subsurface data show that the old seismic surveys using 2-mile loops were not detailed enough to map these low relief structures. Most of the fields cover only 400-700 acres and have only 50-100 ft. of closure, or less, in the shallow beds.

Core drilling using a five-spot pattern is the normal practice with four holes spotted on the section corners; the fifth in the center of the section is drilled to check any possible lead (Fig. 3).

Core holes are actually shallow strat tests with no cores taken and are drilled using truck-mounted heavy-duty shothole rigs, such as a Failing 1500 or a Mayhew 1000.

Electric logs are run on each core hole, using a specially designed sonde, and a shallow Permian marker is used for mapping purposes. Hole depths range from 200-1,000 ft. depending upon the area, amount of Cretaceous overlap and Permian lithology; usually holes 300-500 ft. deep, however, will show the Permian structure (Fig. 2).

Some operators log their seismic shot holes and prepare a shallow core-drill map. This method may require a deep (300-700 ft.) shot hole every mile to reach a key mapping horizon, but it gives both a seismic and a core-hole map. The results can be used as a check on each other.

Gravity and magnetics have been used but are usually checked by core

Fig. 1—Cambrian producing zones have become a primary objective in West Texas exploration. Composite lithologic and electric log shows the stratigraphic section below the Canyon (courtesy of the Abilene Geological Society).

drill or seismic before a deep test is spotted.

Seaboard Oil Co. of Delaware is reported to have two core-drill parties active; Skelly carried out an extensive core-drill program over a period of 4 years. American Trading & Production Corp. and most of the other companies active in West Central Texas have used or are using the core drill for exploration work.

Seismic . . . It is difficult to map Cambrian structures with the seismograph because of the pronounced unconformity between the Pennsylvanian and Cambrian beds and the thin pre-Pennsylvanian section of 1,000 ft. or less. Best method used to date is to map the associated structure in the overlying Pennsylvanian and Permian beds.

A suggested means of mapping the Cambrian is to check seismic records for unusual dips or poor record quality at Cambrian level and map these areas, as outlined by Ben F. Rummerfield *(The Oil and Gas Journal, April 19, 1954, page 205, "Reflection Quality, a Fourth Dimension")*. This approach has been successful in other difficult areas and requires only a review of existing data, rather than an expensive survey.

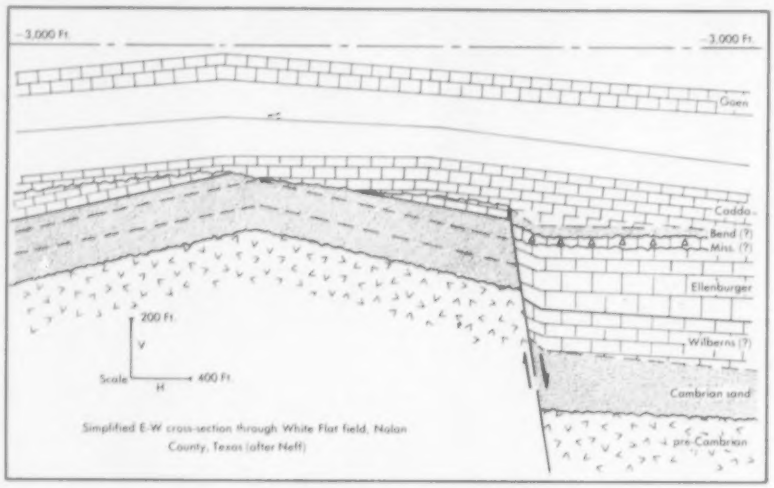
Cambrian Deposition

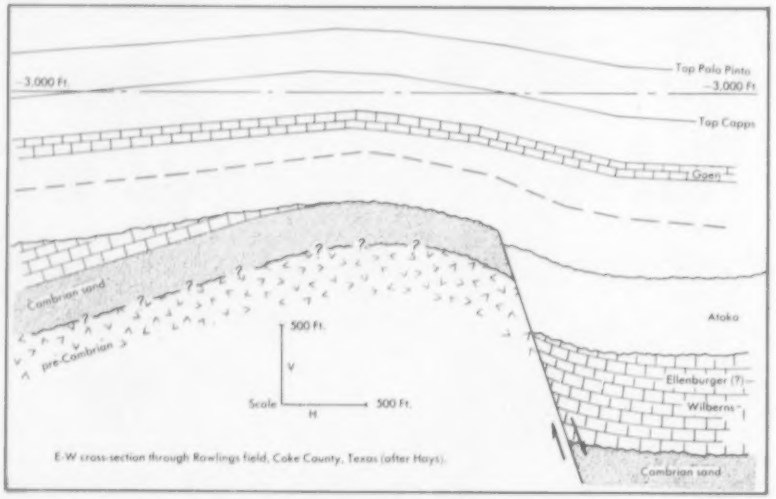
Widespread seas covered the area during Upper Cambrian time, depositing a typical sedimentary sequence. The basal sand, either Hickory or younger, represents the early transgressive phase of marine deposition as the sea gradually spread inland over the old pre-Cambrian land mass (Fig. 1). The topographic surface was peneplaned, but locally at least the terrain was rugged. These irregularities in the old ground surface can be seen in the Llano uplift where pre-Cambrian hills stick up 800 ft. into the overlying Cambrian sediments. In places the granite is in contact with the San Saba limestone, uppermost member of the Wilberns.

The Welge sandstone probably is evidence of a minor unconformity between the Wilberns and the Riley formations. Relatively stable marine conditions existed during the deposition of the San Saba limestone in the late Cambrian (Fig. 1).

Age of the Cambrian reservoirs is still debatable. The Wilberns dolomite probably is correlative with the San Saba of the Llano uplift, 100 miles to the southeast. The Cambrian sand is equivalent to either the Hickory, the Lion Mountain, or even the Welge of the outcrop. Since it probably is a basal sandstone, deposited by a transgressing sea, its age is variable and becomes progressively younger to the northwest.

Ordovician (Ellenburger) sediments were laid down on the Cambrian without a pronounced break in the deposition cycle. As a consequence, it is difficult to distinguish between the Ellenburger and Wilberns dolomite. How-





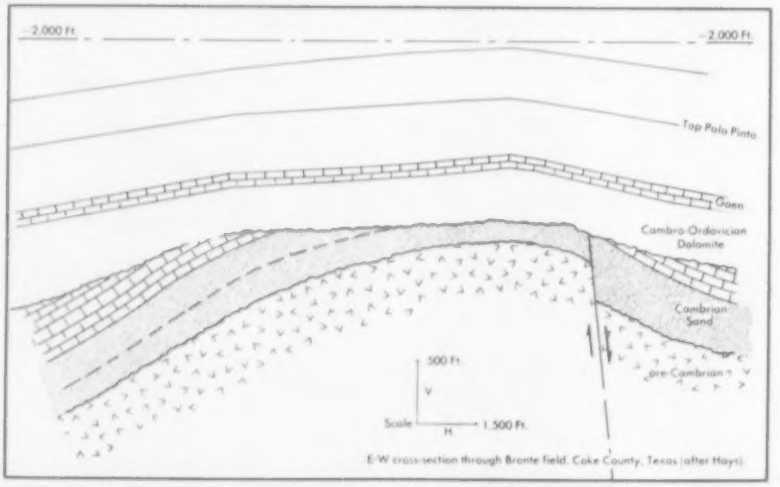


Fig. 2—Structures on the Cambrian trend are very similar as shown by the above cross-section through three producing fields. The sharply folded and faulted Cambrian anticline is only weakly reflected in the overlying Strawn beds. (Courtesy of the San Angelo Geological Society).

ever, the formations can be identified by careful stratigraphic study and insoluble residue work *(The Oil and Gas Journal, April 12, 1954, page 196)*.

Major unconformities between Cambrian and Strawn . . . Two unconformities separate the pre-Pennsylvanian sediments from the lowermost Strawn, and the producing fields have greater relief in the Cambrian than in the overlying Strawn and Canyon sediments. It is probable that many future Cambrian fields will be masked entirely by these unconformities.

This is true today in Oklahoma where Permian and upper Pennsylvanian beds obscure the Springer and Simpson structures. In southern Arkansas and northern Louisiana, the Cretaceous gives almost no indication of the prolific Smackover fields, such as Buckner, Magnolia, and Haynesville.

Present Cambrian producing structures were first formed during pre-Pennsylvanian uplift. These fields were rejuvenated in post-Strawn time and are now weakly reflected in the Pennsylvanian and Permian sediments. This old faultline trend with its associated anticlines had considerable relief as evidenced by the missing section on the crests of White Flat, Rawlings, and Bronte (Fig. 2). At Hylton NW, the Seaboard 1-A Hanks passed from Strawn into pre-Cambrian sediments, indicating that about 1,000 ft. of Ellenburger and Cambrian section has been stripped off by erosion or possibly never deposited. Cambrian structures have 500 to 1,000 ft. of structural relief along the trend as opposed to 100-300 ft. in the overlying Strawn sediments. The structure at Permian level is even weaker with only 30-100 ft. of closure.

Cambrian reservoirs . . . Wilberns dolomite and Cambrian sandstone are the principal pre-Ellenburger pay zones along the Cambrian trend. In addition, however, many of the fields produce from Canyon, Strawn, Caddo, and Ellenburger rocks.

At White Flat field, American Trading & Production 1 Little cored 157 ft. of Cambrian sand with an average porosity of 11.9 per cent and permeability of 168.3 md. The sand is a glauconitic locally dolomitic, fairly well-sorted porous sandstone. Lithology of the sandstone, however, is not uniform over the entire trend; at E. A. field it becomes tighter and more glauconitic. At North Dora, it is a fine-to-medium grained, well-sorted porous sandstone. The Skelly 3-B Boyd cored 125 ft. of this very porous and permeable zone above water.

Vuggy dolomite is typical of the upper portion of the Wilberns at White Flat. This grades downward into a white-to-light tan, fine-to-coarsely crystalline, porous dolomite. Locally the dolomite contains chert and sand grains.

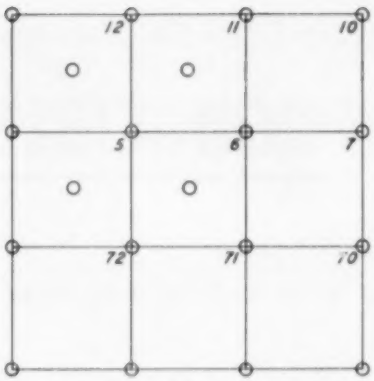


Fig. 3—Core holes drilled to depths of 300 to 1,000 ft. are used to map prospects. A five-spot pattern is used with holes drilled on the section corners, 1 mile apart. The fifth is drilled in the center of the section to check any lead.

Wilberns production at White Flat is considered to be comparable to that from the Cambrian sand wells.

Areal extent of reservoirs . . . Cambrian reservoirs undoubtedly are present under much of West Central Texas, from Stonewall County southeast to the Llano uplift, since wells in Tom Green, Schleicher, and Suggon counties have drilled through the Cambrian sandstone above granite.

Production thus far has been limited to the present rather narrow trend in eastern Coke and Nolan counties. However, commercial shows were reported in 1942 from the Cambrian in Pecos County. This was in the Gulf Oil Corp. 3 Millar that has produced 60,000 bbl. of oil from a pre-Ellenburger sand at 4,380-95 ft.

Factors affecting production . . . Some geologists point to the fact that no Cambrian production has come from rocks that underlie salt-water-bearing Ellenburger and have the record to support their conclusion. Other geologists use the rule of thumb that Cambrian production is associated with structures that have a thin Ellenburger section or that have no Ellenburger.

Source of the Cambrian oil is still a moot question. The most popular theory is that the oil has migrated into the Cambrian from the overlying Pennsylvanian sediments and is not indigenous.

A more optimistic school of thought holds that Cambrian oil may be indigenous. After all, the Wilberns and Riley are marine formations, deposited under marine conditions and as a conse-

(Continued on page 144)

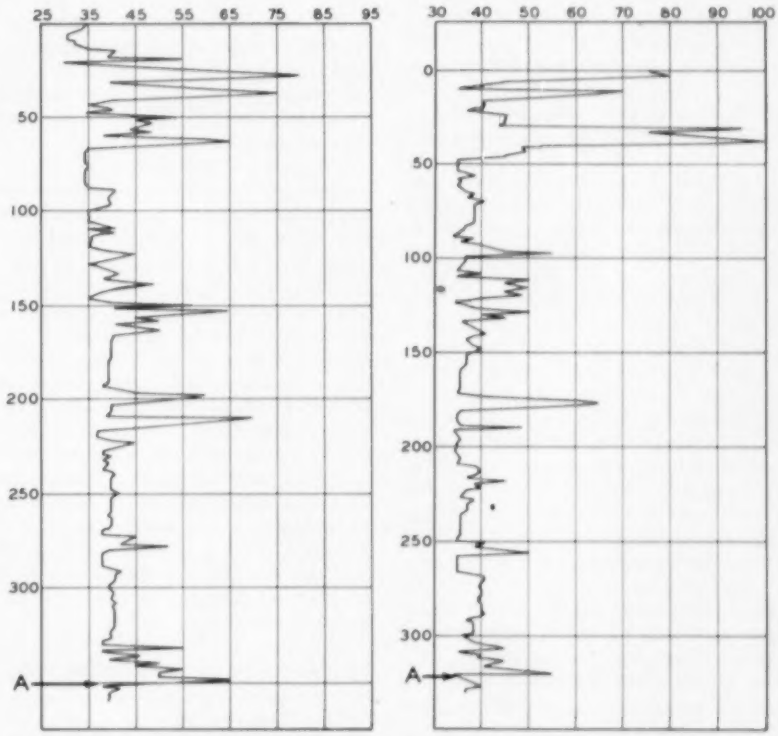


Fig. 4—Logs of core holes along the Cambrian trend. Operators drill to a persistent Permian marker such as the top of the red shale bed marked "A" and prepare structural maps on this horizon.

How to Use Electrical Log Data to Determine

MAXIMUM PRODUCIBLE OIL INDEX

in a formation

by H. G. Doll and M. Martin

A New Electrical Logging Tool . . .

In this article, a method is described whereby the Maximum Producible Oil Index, i.e. the amount of oil per unit volume of reservoir formations which is displaced by mud filtrate, can be determined from electrical log data, by means of a very simple formula which does not imply the knowledge of formation factor, or porosity, or residual oil saturation. Charts are provided for the computation of the Maximum Producible Oil Index in barrels of oil per acre-foot.

THE quantitative interpretation of the electrical logs, in the case of formations substantially free of shaly material, is based on the following four parameters:

R_{xo} = resistivity of the part of the formation flushed by mud filtrate (close to the wall of the hole)

R_t = resistivity of the part of the formation uncontaminated by mud filtrate

R_{mf} = resistivity of mud filtrate

R_w = resistivity of connate water

R_{xo} and R_t are the two parameters which are given by the resistivity curves, provided proper measuring devices are used and appropriate correction factors are applied.

It is common practice at the present time to make use of the four parameters R_{xo}, R_t, R_{mf}, R_w for the evaluation of the fluid saturation and of the porosity of the reservoirs. In the case of oil-bearing formations this evaluation requires that an assumption be made on the value of the residual oil saturation in the flushed zone, and an error made in the estimation of residual oil entails some error in the values found for saturation and porosity.

The Maximum Producible Oil Index, which is the subject of the present paper, is another factor which can be derived from the four parameters, R_{xo}, R_t, R_{mf}, R_w. This factor will be defined as the amount of oil per unit volume of a reservoir formation which is displaced by the penetration of mud filtrate.

One important feature of the Maximum Producible Oil Index is that it can be computed in a very simple way, and without necessity for an assumption on the value of the residual oil saturation.

The significance of the Maximum Producible Oil Index will furthermore appear clearly if it is considered that the knowledge of fluid saturation and of porosity does not always make possible a safe estimation, even only qualitatively, of the production to be expected from a reservoir: when, for example, the reservoir contains very viscous oil, a good oil saturation may correspond to a very low rate of production, and even to no production at all. The determination of the Maximum Producible Oil Index provides valuable additional information in this respect: if it is found that a certain amount of oil was displaced outwardly by the action of mud filtrate during the drilling process, it is likely that oil can flow in the reverse direction towards the bore hole when the well is tested for production. If, conversely, no oil was displaced by the penetration of mud filtrate no significant production should be expected, however great the oil saturation may be.*

Moreover, in the flushed zone, the oil is displaced by water having a slow movement, except probably for a fraction of an inch immediately behind the wall, which is flushed first at the time the mud cake has not yet formed, and when, therefore, the regime of filtration might be somewhat turbulent. This condition of slow movement should apparently also apply to the whole reservoir during production, except for a distance of a few feet around the drill hole where the fluid velocity might be high enough to produce some turbulence. It seems therefore logical to assume that the proportion of residual oil in the flushed zone is of the same order of magnitude as the proportion of oil that cannot be displaced from the reservoir by an efficient water drive. In other words, the Maximum Producible Oil Index should give a good indication of the total amount of oil at reservoir conditions which can be yielded by a given reservoir under water drive until complete exhaustion.†

Accordingly, it is thought that the knowledge of the Maximum Producible Oil Index could help in the estimation of recoverable reserves, especially in the case of secondary recovery by water flooding.

Computation of Maximum Producible Oil Index

Considering the case of porous formations substantially free from shaly material, and supposing, for simplicity,‡ that the exponents m and n in Archie's[1] are both equal to 2, the proportions of unit volume of formation occupied by water in the flushed zone and in the uncontaminated zone are respectively equal to $(R_{mf}/R_{xo})^{1/2}$ and $(R_w/R_t)^{1/2}$.

The Maximum Producible Oil Index Y§ at reservoir conditions, i.e., the

The authors are director of research and head of the publication and interpretation department, respectively, of Schlumberger Well Surveying Corp., Ridgefield, Conn.

*This supposes that no process as acidizing, artificial fracturing, shooting . . ., which changes the physical conditions in the formation, has intervened between the amount the logs are run and the moment the formation is tested.

†In the case of gas drive, the situation is appreciably different, and the Maximum Producible Oil Index would give only an order of magnitude of the total amount of oil produced.

‡It will be shown, later on, that this simplification is generally acceptable in the evaluation of the Maximum Producible Oil Index.

§Letters, P, O, I can hardly be adopted to designate Maximum Producible Oil Index, because they are already widely used symbols. The letter Y has been chosen for mnemotechnic reason, as recalling oil "yielded" by the reservoir.

amount of oil per unit volume which is displaced by mud filtrate, is equal to the difference between these two factors, or:

$$Y = (R_{mf}/R_{xo})^{1/2} - (R_w/R_t)^{1/2} \quad (1)$$

This simple equation does not involve the value of formation factor, or of porosity, or of residual oil saturation.

In practical units, this equation would read:

Y in barrels per acre-foot (at reservoir conditions)

$$= 7{,}760\,[(R_{mf}/R_{xo})^{1/2} - (R_w/R_t)^{1/2}] \quad (2)$$

Regarding the four quantities shown in the right-hand members of Equations 1 and 2:

R_{xo}, resistivity of the flushed zone, can be derived from the MicroLog, in formations of high enough porosity—or by the MicroLaterolog (in the present state of the MicroLaterolog technique, a reasonable accuracy is obtained only when the mud cake is thin, as is the case when high salinity mud is used).

R_t, the true resistivity of the formation, can be obtained from the conventional resistivity curves in case of beds of sufficient thickness. For thin beds, the use of Laterolog[4] and/or Induction Logging[5] is necessary.

R_{mf}, the resistivity of mud filtrate, can be estimated from the table of average statistical values published in Schlumberger Document No. 5, or, better still, should be measured directly on samples of mud filtrate obtained by means of an appropriate filter press, and the values found should be corrected for BHT.

R_w, the resistivity of connate water, can be very often obtained from direct measurement on samples, or, if such are not available, should be estimated from the S.P. surve.[6 7 8]

It can be seen that, in the case of a clean water-bearing formation, the above Equations 1 and 2 would give zero value for Y, since R_{mf}/R_{xo} is equal to R_w/R_t in this case.

The value of Y can be conveniently determined by means of a chart such as Chart I, where the values of R_{xo}/R_{mf} and R_t/R_w¶ are borne respectively in abscissas and in ordinates, and where the curves correspond to equal values of Y in practical units.

Example . . . The formation is supposed to be a clean sand and the electrical logs give $R_t = 5$ and $R_{xo} = 8$. It is furthermore supposed that R_{mf}, measured on a sample of mud, is 0.5 and R_w, measured on a sample of connate water, is 0.04.

It is seen that:

$$R_{xo}/R_{mf} = 8/0.5 = 16$$

$$R_t/R_w = 5/0.04 = 125$$

Point A on Chart 1, abscissa 16 and ordinate 125, falls between curves Y = 1,200 and Y = 1,500. Actually Y is found to be a little more than 1,200.

Accuracy in the determination . . . Supposing an error of ±20 per cent is possible on R_{xo} and R_t, and supposing R_{mf} and R_w are known exactly:

R_{xo}/R_{mf} is between 13 and 19

and

R_t/R_w is between 100 and 150

The shaded rectangle on Chart 1 contains all the possible positions of Point A corresponding to the above errors. This rectangle determines the corresponding range of values for Y, i.e., from 1,000 to 1,500 bbl. per acre-foot.

Remark

It was pointed out above that the values of formation factor, or of residual oil saturation do not enter into Equations 1 or 2, which give Y.

It is recalled that the knowledge of these parameters is necessary in the determination of porosity (in case of oil-bearing formations) and of fluid saturation:

Still supposing, for simplicity, that $m = n = 2$, the expression $(R_{mf}/R_{xo})^{1/2}$ gives the value of porosity when the formation is water bearing. When the formation contains oil, the expression has to be corrected for the residual-oil saturation (ROS) in the flushed zone. The porosity is then approximately equal to:

$$\frac{1}{1 - ROS}\,(R_{mf}/R_{xo})^{1/2}$$

On the other hand, Archie's formula for saturation reads:

$$S_t = (FR_w/R_t)^{1/2} \quad (3)$$

where S_t is the water saturation in the uncontaminated part of the bed, and F is the formation factor.

Likewise:

$$S_{xo} = (FR_{mf}/R_{xo})^{1/2} \quad (4)$$

where S_{xo} is the water saturation in the flushed zone.

It is easy to eliminate F between Equations 3 and 4.

It comes:

$$S_t = S_{xo}\,(R_wR_{xo}/R_tR_{mf})^{1/2}$$

$$= (1 - ROS)\,(R_wR_{xo}/R_tR_{mf})^{1/2} \quad (5)$$

This shows that the determination of S_t involves either the knowledge of the formation factor F (Equation 3)—or of the residual-oil saturation ROS (Equation 5).

The formation factor can be measured directly on cores, or derived from the porosity values given by the neutron curve, in clean formations.

The residual-oil saturation in the flushed zone is very difficult to evaluate: the value usually accepted for log analysis is equal to the oil saturation measured on formation samples, taken with water-base mud—if such is available. This value is a rough approximation which may entail appreciable errors in the computation of porosity and of saturation, chiefly in the case of high-viscosity oil, where ROS may be particularly great.

Influences of the Values of m and n

If m and n are not both equal to 2, the equation giving Y is more complex:

Archie's equations, for the flushed zone and the uncontaminated zone read respectively:

$$S_{xo} = (FR_{mf}/R_{xo})^{1/n} \quad (6)$$

and

$$S_t = (FR_w/R_t)^{1/n} \quad (7)$$

The proportion per pore volume of oil displaced by mud filtrate, $S_{xo} - S_t$, is:

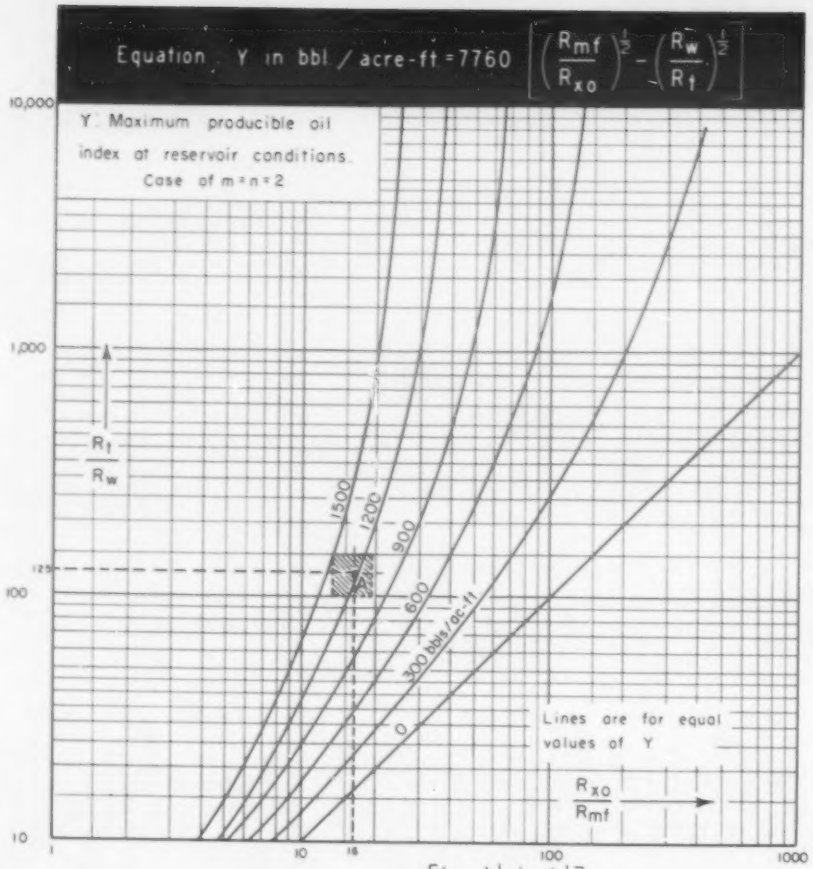
$$S_{xo} - S_t = (FR_{mf}/R_{xo})^{1/n} - (FR_w/R_t)^{1/n} \quad (8)$$

and the proportion of displaced oil per unit volume of formation is:

"The Maximum Producible Oil Index is a valuable clue in estimating the production to be expected at reservoir conditions from a given reservoir, which information is not always given by the knowledge of saturation and porosity only, especially in the case of high-gravity oil."

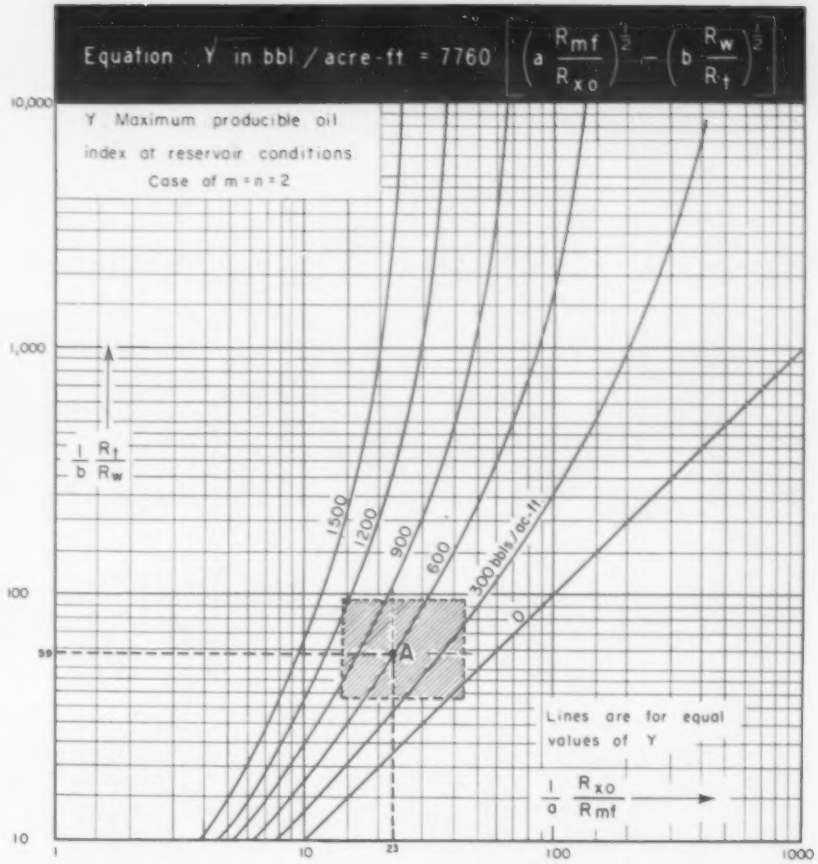
¶The values of R_{xo}/R_{mf} and R_t/R_w are used in the chart instead of R_{mf}/R_{xo} and R_w/R_t in order to avoid inconvenient decimal fractions in the numerical applications.

Chart 1



Equation: Y in bbls./ac-ft = $7760\left[\left(\frac{R_{mf}}{R_{xo}}\right)^{\frac{1}{2}} - \left(\frac{R_w}{R_t}\right)^{\frac{1}{2}}\right]$

Chart 2



Equation: Y in bbls/ac-ft. = $7760\left[\left(a\frac{R_{mf}}{R_{xo}}\right)^{\frac{1}{2}} - \left(b\frac{R_w}{R_t}\right)^{\frac{1}{2}}\right]$

$\frac{1}{a}$ and $\frac{1}{b}$ derived from Charts 3 and 4 respectively.
(For more precision, the result can be multiplied by $\left(1-p\right)^{\frac{1}{2}}$ given by Charts 3 or 4)

"It can be assumed that the value of this parameter (M.P.O.I.) represents approximately the total amount of oil per unit volume of formation under reservoir conditions which could be produced by water drive."

$$Y = (S_{xo} - S_t)\,\phi$$

where ϕ is the porosity.

ϕ in turn can be taken equal to $(1/F)^{1/m}$.

Hence:

$$Y = (S_{xo} - S_t)\,(1/F)^{1/m} = F^{1/n-1/m} \times [(R_{mf}/R_{xo})^{1/n} - (R_w/R_t)^{1/n}] \quad (9)$$

or taking F from Equation 6:

$$Y = S_{xo}^{1-n/m}\,(R_{xo}/R_{mf})^{1/n-1/m} \times [(R_{mf}/R_{xo})^{1/n} - (R_w/R_t)^{1/n}] \quad (10)$$

S_{xo} is probably very seldom smaller than 0.6. Exponents m and n are usually between 1.7 and 2.2, and the ratio n/m does not vary outside the range 0.8 to 1.25 in most cases. The value of $S_{xo}^{1-n/m}$ therefore should not generally differ from 1 by more than 10 to 15 per cent, and could be taken equal to 1, at least as a first approximation, which leads to the equation:

$$Y = (R_{xo}/R_{mf})^{1/n-1/m} \times [(R_{mf}/R_{xo})^{1/n} - (R_w/R_t)^{1/n}] \quad (11)$$

In practical units this equation would read:

$$Y \text{ in barrels per acre-foot (at reservoir conditions)} = 7{,}760\,(R_{xo}/R_{mf})^{1/n-1/m} \times [(R_{mf}/R_{xo})^{1/n} - (R_w/R_t)^{1/n}] \quad (12)$$

It is seen again on Equations 11 and 12 that, if a formation is water bearing, Y equals zero, since R_{mf}/R_{xo} equals R_w/R_t.

If $m = n = 2$, Equations 11 and 12 reduce respectively to Equations 1 and 2.

When m and n are different from 2 the departure of the values found for Y through Equation 12 from the values found from Equation 2, will be evaluated on some numerical examples:

Unconsolidated formations . . . Let us suppose $n = 1.8$ and m varies between 1.7 and 2, and let us take $R_{xo}/R_{mf} = 20$ and $R_t/R_w = 100$.

$(R_{xo}/R_{mf})^{1/n-1/m}$ is between 0.904 and 1.18.

$(R_{mf}/R_{xo})^{1/n} - (R_w/R_t)^{1/n}$ is equal to 0.112.

Y thus varies between 780 and 1,030 bbl. per acre-foot instead of having the value of 960 as would be found from the application of Equation 2.

Hard formations . . . It is now supposed that $n = 2$ and m varies between 1.8 and 2.2. Furthermore R_{xo}/R_{mf} is taken equal to 100 and R_t/R_w to 500.

$(R_{xo}/R_{mf})^{1/n-1/m}$ is found comprised between 0.78 and 1.23, hence Y varies between 330 and 525 bbl. per acre-foot instead of having the value of 430 as given by Equation 2.

The differences are not too great—and it seems that taking $m = n = 2$ should be sufficient in most cases for all practical purposes.

If, of course, in some region, the values of m and n are known from statistical measurements on cores to be appreciably different from 2, a chart similar to Chart 1 can be easily established for these values.

Case of Shaly Sands

It is known that the presence of shales within a sand is a cause of difficulty in the interpretation.

The problem of shaly sands has been the subject of thorough investigations, and valuable results have already been obtained and published (Ref. 9 to 19). In a recent paper, dealing with the qualitative and also semiquantitative analysis of the electrical logs in shaly sands,[20] two separate approaches are discussed, one with the assumption that the shaly sand is a sandwich of thin laminations of pure sand and pure shale, the other that the shales are disseminated in the pores of the sand. It is suggested in that paper, on the basis of a still limited experience, that the values of porosity and saturation derived from the logs according to both approaches should be substantially the same. Since furthermore the first assumption—shale and sand laminations—lends itself to simpler computations, this assumption is used in the paper to establish the nomograms for the quantitative application of the proposed method.

In the present case, it also appears that the Maximum Producible Oil Index in a shaly formation can be determined by means of comparatively simple nomograms and graphics if the same hypothesis is retained, i.e., if the formation is supposed to be composed of laminated thin sands and shales.

The following discussion is therefore based on this assumption. It must be understood that the corresponding conclusions are only tentative and may be subject further on to revision and correction as more data from field and laboratory experiments become available.

In the case of a succession of thin parallel layers, alternately of clear sand and of pure shale, the resistivities R_{xo}^s and R_t^s of each individual sand layer, corresponding respectively to the flushed zone and to the uncontaminated zone, are related to the resistivity R_{sh} of each individual shale bed, and to the resistivities derived from the electrical logs through the equations:

$$\frac{1}{R_{xo}} = \frac{p}{R_{sh}} + \frac{1-p}{R_{xo}^s} \quad (13)$$

$$\frac{1}{R_t} = \frac{p}{R_{sh}} + \frac{1-p}{R_t^s} \quad (14)$$

where:

- p = proportion of shale streaks in the shaly sand
- R_{xo}^s = resistivity of each sand streak close to the wall
- R_{xo} = harmonic average of resistivities close to the wall (R_{xo} is the value given by the Micro-Log or the MicroLaterolog opposite the shaly sand)
- R_t^s = resistivity of the uncontaminated part of each individual sand streak
- R_t = resistivity of the uncontaminated zone of the shaly sand (R_t is the value obtained by deep investigation devices, such as Induction Log, long normal, lateral . . . etc. . . ., after proper correction by means of departure curves if necessary)

Supposing again that exponents m and n are both equal to 2, Equation 1, when applied to the sand streaks would read:

$$Y \text{ in sand streaks} = (R_{mf}/R_{xo}^s)^{1/2} - (R_w/R_t^s)^{1/2} \quad (15)$$

and the value of Y for the sandwich will be:

$$Y = (1 - p) \times [(R_{mf}/R_{xo}^s)^{1/2} - (R_w/R_t^s)^{1/2}] \quad (16)$$

Replacing R_{xo}^s and R_t^s by their values, as extracted from Equations 13 and 14, it comes:

$$Y = (1-p)\left\{\left[\frac{R_{mf}}{1-p}\left(\frac{1}{R_{xo}} - \frac{p}{R_{sh}}\right)\right]^{\frac{1}{2}} - \left[\frac{R_w}{1-p}\left(\frac{1}{R_t} - \frac{p}{R_{sh}}\right)\right]^{\frac{1}{2}}\right\} \quad (17)$$

or:

$$Y \quad (1-p)^{\frac{1}{2}}\left\{\left[\frac{R_{mf}}{R_{xo}}\left(1-p\,\frac{R_{xo}}{R_{sh}}\right)\right]^{\frac{1}{2}} - \left[\frac{R_w}{R_t}\left(1-p\,\frac{R_t}{R_{sh}}\right)\right]^{\frac{1}{2}}\right\} \quad (18)$$

which can also be written:

$$Y = (1-p)^{1/2} \times [(aR_{mf}/R_{xo})^{1/2} - (bR_w/R_t)^{1/2}] \quad (19)$$

with

$$a = (1-p)\,R_{xo}/R_{sh}$$

$$b = (1-p)\,R_t/R_{sh}$$

or in practical units:

$$Y \text{ in barrels per acre-foot (at reservoir conditions)} = 7{,}760\,(1-p)^{1/2} \times [(aR_{mf}/R_{xo})^{1/2} - (bR_w/R_t)^{1/2}] \quad (20)$$

Equations 19 and 20 are similar to Equations 1 and 2 and the values of Y in the case of shaly sands can be therefore obtained through the use of the same chart as for clean sands, provided that the values of R_{xo}/R_{mf} and R_t/R_w are respectively multiplied by factors 1/a and 1/b, and that the value read on the chart is multiplied by $(1-p)^{1/2}$.

It should be remarked that, in most cases, the proportion of shale p does not exceed 30 per cent so that $(1-p)^{1/2}$ differs from unity by less than 15 per cent. Factor $(1-p)^{1/2}$ can therefore be neglected, as a first approximation, unless the shale content is known to be particularly great. Chart 2 is established, for simplicity, supposing $(1-p)^{1/2}$ is substantially equal to 1. For more precision, the values of Y derived from Chart 2 can be multiplied by $(1-p)^{1/2}$, which in turn is given by Charts 3 and 4,* as explained hereafter.

Charts 3 and 4 are used for the evaluation of 1/a and 1/b and eventually $(1-p)^{1/2}$.

As is seen on the charts, the computation of these factors involves the knowledge of α, the reduction factor of the S.P., which is equal to the ratio of the pseudostatic S.P. observed opposite the bed under consideration to the static S.P. which would be obtained of the formation were clean, all other conditions being the same[6 10] (supposing that the electrokinetic component of the S.P. is negligible with respect to the electrochemical component, which seems to be the case very often, at least in formations where the connate waters have a high salinity—or that the electrokinetic component can be corrected for).

The value of R_{sh}, resistivity of the shale streaks, also appears in the charts. This value is usually taken equal to the resistivity of the thick shale beds adjacent to the shaly sand.

Example . . . The use of the charts is shown in the following example:

$\alpha = 0.6$; $R_{xo} = 3$; $R_t = 2$; $R_{sh} = 1$; $R_{mf} = 0.25$; $R_w = 0.05$

Hence:

$R_{xo}/R_t = 1.5$; $R_t/R_{xo} = 0.666$;

$R_{xo}/R_{sh} = 3$; $R_t/R_{sh} = 2$

(a) Determination of 1/a, 1/b, and $(1-p)^{1/2}$ (Charts 3 and 4).

A vertical line, abscissa $\alpha = 0.6$ is traced through the graph at the left-hand side of Chart 3 until it crosses in A the curve corresponding to $R_{xo}/R_t = 1.5$ (interpolated between curves 1 and 2). A horizontal line is drawn from A which crosses the vertical 1/a scale at B. The figure read at B gives the value of 1/a equal to 1.9. Next, a line is traced from B through C corresponding to $R_{xo}/R_{sh} = 3$ on the R_{xo}/R_{sh} scale. This line crosses the p scale at D (which incidentally gives the value for p equal to 0.17) and the opposite figure read in E on the last scale gives the corresponding value of $(1-p)^{1/2}$, i.e., 0.92.

Chart 4 is similar to Chart 3, except that the values of R_t/R_{xo} and R_t/R_{sh} are entered respectively instead of R_{xo}/R_t and R_{xo}/R_{sh}. The value found for 1/b — point B′ — is equal to 1.47 and the value arrived at for $1-p$ (point E′) is the same of course as from Chart 3, i.e., 0.92.

(b) Determination of Y (Chart 2).

From the above numerical values, one has:

$$R_{xo}/R_{mf} = 3/0.25 = 12$$

$$R_t/R_w = 2/0.05 = 40$$

and

$$\frac{1}{a}\,\frac{R_{xo}}{R_{mf}} = 12 \times 1.9 = 23$$

$$\frac{1}{b}\,\frac{R_t}{R_w} = 40 \times 1.47 = 59$$

Entering these values into Chart 2 gives 600.

The correcting factor $(1-p)^{1/2} = 0.92$ is close to 1, and could be neglected without entailing a large difference. If, for a better accuracy, this value is taken into account, Y is found equal to 0.92×600: 550 bbl. per acre-foot.

Accuracy in the Determination.

Let us suppose again that an error of ±20 per cent is possible on the values of R_{xo} and R_t, in other words, that:

R_{xo} is between 2.4 and 3.6

R_t is between 1.6 and 2.4

or

R_{xo}/R_t is between 1.0 and 2.25

R_t/R_{xo} is between 0.45 and 1

Let us also take α between 0.5 and 0.7 and let us suppose that R_{mf} and R_w are known exactly.

The shaded area on Chart 2 represents approximately the corresponding region where point A can be located: it thus appears that Y may vary between about 0 and 1,300, or more exactly, with $(1-p)^{1/2}$ being taken into consideration, between 0 and about 1,200.

This example shows that for a correct application of the method in the case of shaly sands, the basic parameters, i.e., R_{xo}, R_t, and α, should be known with a great accuracy, much greater than the accuracy required in the case of clean formations.

Acknowledgments

The authors are indebted to A. Poupon, K. S. Kunz, and F. Segesman for their efficient assistance in the preparation of this paper. They wish also to express appreciation to M. E. Loy, M. C. Watson, M. P. Tixier, and L. Allaud for their helpful discussions on the practical aspects of the subject treated.

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*How Charts 3 and 4 are established is explained in the appendix.

Chart 3

Determination of $\frac{1}{a}$ and $\left(1-p\right)^{\frac{1}{2}}$

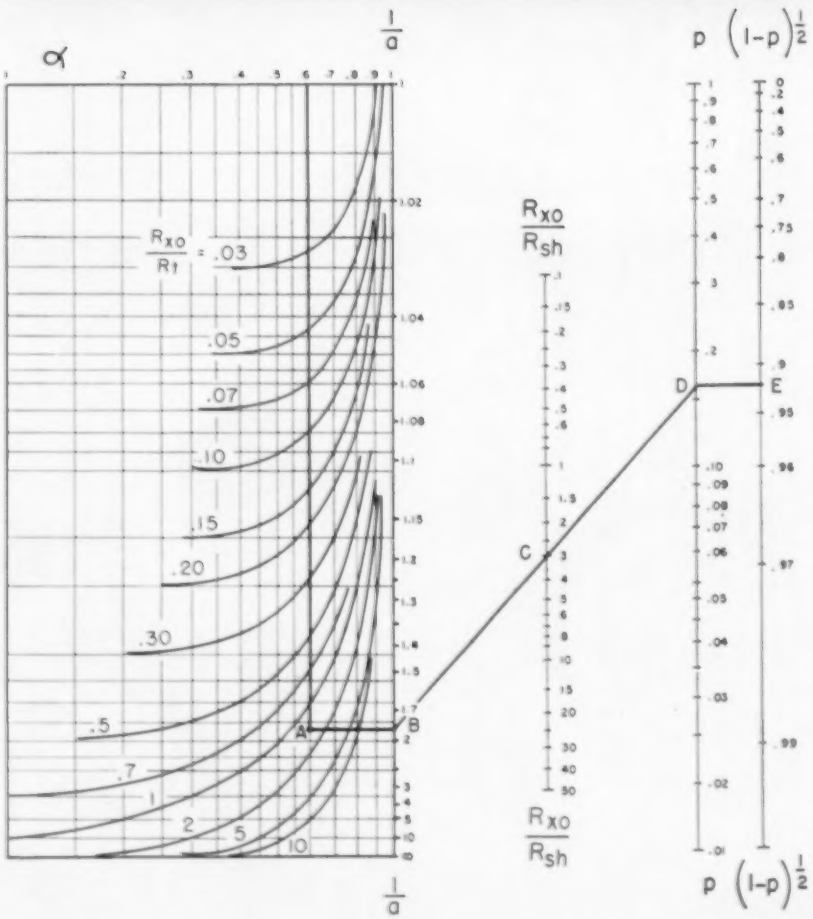
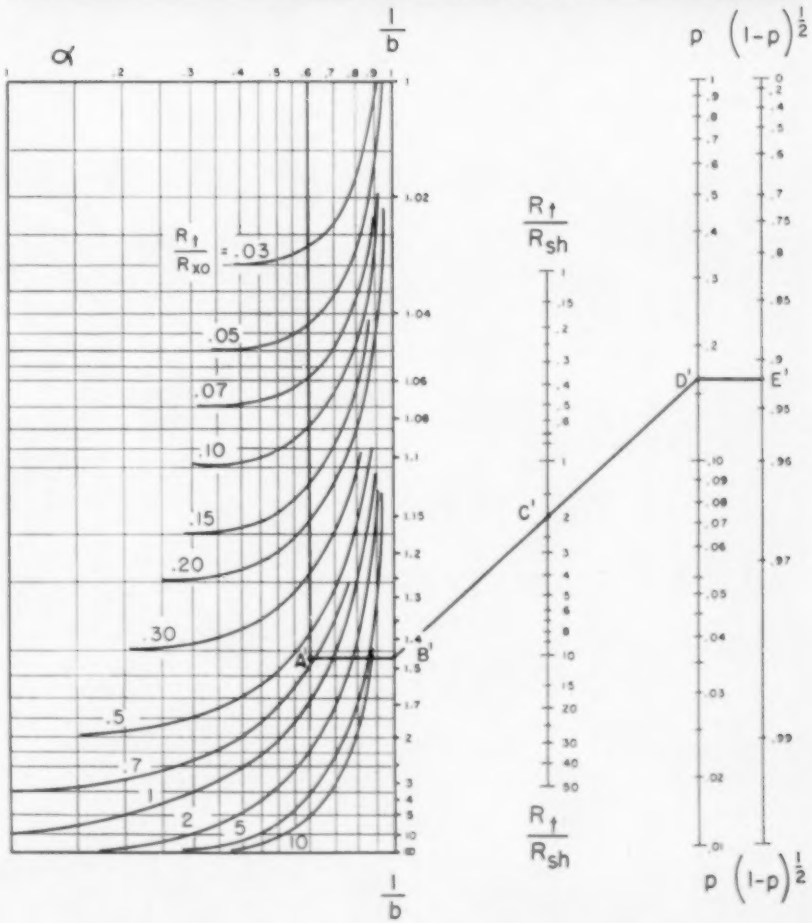


Chart 4

Determination of $\frac{1}{b}$ and $\left(1-p\right)^{\frac{1}{2}}$



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Appendix

Charts 3 and 4 are established from Equation 6′ given in A. Poupon's et al. paper on "A Contribution to Electrical Log Interpretation in Shaly Sands."[20]

This equation reads:

$$a = -\frac{\log R_t/R_{xo}}{\log\left(\dfrac{R_t/R_{xo} - pR_t/R_{sh}}{1 - pR_t/R_{sh}}\right)} \qquad (6')$$

The left-hand side of Chart 4 shows the graphical solution of Equation 6′. The three variables involved are a, R_t/R_{xo} and pR_t/R_{sh}. The 1/b scale, for the sake of convenience, bears the values of $1/b = 1/(1 - pR_t/R_{sh})$.

Equation 6′ can be also written:

$$a = \frac{\log R_{xo}/R_t}{\log\left(\dfrac{1 - pR_t/R_{sh}}{R_t/R_{xo} - pR_t/R_{sh}}\right)}$$

or, multiplying the numerator and the denominator of the lower parenthesis by R_{xo}/R_t:

$$a = \frac{\log R_{xo}/R_t}{\log\left(\dfrac{R_{xo}/R_t - pR_{xo}/R_{sh}}{1 - pR_{xo}/R_{sh}}\right)}$$

This equation is used to determine Chart 3 in the same way as Equation 6′ for Chart 4: the variables are a, R_{xo}/R_t and pR_{xo}/R_{sh} and the 1/a scale is numbered in values of $1/a = 1/(1 - pR_{xo}/R_{sh})$.

Numerical Examples of Electric-Log Equations:

Fifteen Practical Field Calculations

by H. G. Doll and M. Martin

SOME of the equations in the foregoing discussion will be illustrated by numerical examples.

Since most of the equations are in the usual D'Arcy law units instead of in field units, it is convenient to note that these equations retain their constants if the permeability is expressed in "perms," pressure in psi., production in cubic feet per day, time in days, distance or height in feet, and viscosity in centipoises.

The permeability in perms is obtained by multiplying the permeability in darcies by 6.3. (Comparison of Equations 16 and 63 shows that this is obtained from $7.07 \times 5.61 \div 2\pi$. The units of the perm in the literature seem to be inconsistent.)

Average Pressure in a Radial System

The volumetrically weighted average pressure in a radial system in which production is by liquid expansion is given by Equations 22-31.

1. What is the average pressure if $p_e = 1{,}200$, $p_w = 500$ psi., $r_e = 1{,}500$ ft., $r_w = 0.3$ ft., for steady state with the flux equal over both boundaries? Substitution in Equation 28a gives:

$$p_{av} = 1{,}200 - [(1{,}200 - 500)/2 \times 2.3 \log 5{,}000]$$

$$= 1{,}200 - 700/17 = 1{,}159 \text{ psi.}$$

2. What would be the pressure at r_e for the same production as Problem 1 if this boundary were closed, and what would be the average pressure? Comparison of Equations 28 and 29 shows that the pressure at r_e for the closed system is the same as the average pressure would be with the same production, and with equal flux over both boundaries, or $p_e = 1{,}159$ psi. Substitution for q by the conditions of Problem 1 (Equation 16) in Equation 30 gives:

$$p_{av} = 1{,}200 - [3\,(1{,}200 - 500)/4 \times 2.3 \log 5{,}000]$$

$$= 1{,}200 - 2{,}100/34 = 1{,}138 \text{ psi.}$$

Since the system is closed, this is the final buildup pressure that would be reached after prolonged shut in.

Pressure Changes at Internal Boundary Due to Assumed Production Rates

Equations 36 to 47, due to Hurst and van Everdingen, are convenient for finding pressure changes at a well or an internal boundary of an aquifer due to given flow rates over these boundaries for production due to liquid expansion.

3. For a simple example, assume that a well in an infinite system at initially uniform pressure of 1,500 psi. is suddenly opened and maintained at a production rate of 1,200 reservoir cubic feet per day. Find the bottom-hole pressure as a function of time, using the following data:

$h = 30$ ft.
$\mu = 1.5$ cp.
$r_w = 0.3$ ft.
$f = 0.18$
$c = 0.000006$ per psi.
$K = 35$ md. $= 0.22$ perm

Using first the "reduced" values, Δp may be found as a function of t from Equations 40-43 or from Fig. 4 as follows:

$\mathbf{t}$	0	0.01	1	100	10^4	10^6	10^8
$\Delta\mathbf{p}$	0	0.11	0.8	2.74	5.0	7.3	9.6

The actual times in days corresponding to the above reduced times are given by Equation 36:

$$t = \mathbf{t} \times 0.18 \times 0.000006 \times 1.5 \times (0.3)^2/0.22 = 6.6 \times 10^{-7}\,\mathbf{t}$$

It is immediately apparent that only the higher values of t, where the pressure drop is given by the simple logarithmic relation (41) is of any interest for small values of the internal boundary such as the radius of a well. The actual pressure drops (psi.) are given by Equation 39.

$$p_e - p_w = \Delta\mathbf{p} \times 1{,}200 \times 1.5/2\pi \times 0.22 \times 30 = 45\,\Delta\mathbf{p}$$

The calculated pressure drops and bottom-hole pressures are, therefore, as follows:

t (days)	0	7×10^{-9}	7×10^{-7}	7×10^{-5}	0.0066	0.66	66
Δp (psi.)	0	5	36	123	225	329	432
p_w (psi.)	0	1,495	1,464	1,377	1,275	1,171	1,068

4. If instead of a well, the internal boundary were that of an "infinite" aquifer of internal radius 3,000 ft., other constants (including c) being the same, $t = 66\,\mathbf{t}$, and the values of t in the preceding table would be 10^8 as great, the "production" of 1,200 cu. ft. per day being the flux over this boundary. For instance, the pressure at the boundary would be 1,464 psi. after 66 days and 377 psi. after 6,600 days. (Of course the assumption of an infinite aquifer would not have practical significance after 6,600 days since the effect would be "felt" at outer boundary of the largest known aquifer.)

5. If the withdrawal rate from the well in Problem 3 had been 1,200 cu. ft. per day for 24 days and then 1,500 cu. ft. per day for the next 36 days, what would be the draw-drawn as a function of time? The method of superposition is applied, that is, it is assumed that the rate is continued at 1,200 for 60 days but that the rate of 300 is "superposed" at $t = 24$ to $t = 60$. From Problem 3, $\mathbf{t} = 1.5 \times 10^6\,t$, and Δp ($= 45\,\Delta\mathbf{p}$) is calculated from $t = 0$ to $t = 60$. $\Delta p'$ ($= 11.1\,\Delta\mathbf{p}$) is calculated from $t = 0$ to $t = 36$, but is added to the first Δp starting at $t = 24$. The table shows the calculation, assuming $\Delta\mathbf{p} = \frac{1}{2}(\ln \mathbf{t} + 0.809)$.

t (days)	8	16	24	32	36	44	52	60
$\mathbf{t} \times 10^{-6}$	12	24	36	48	54	66	78	90
$\Delta\mathbf{p}$	8.54	8.90	9.10	9.24	9.30	9.40	9.48	9.55
$45\,\mathbf{p}$	384	400	409	415	418	423	426	430
$11.1\,\Delta\mathbf{p}$			0	95	99	101	102	103
Δp	384	400	409	510	517	524	528	533
p_w	1,116	1,100	1,091	990	983	976	972	967

6. If, instead of increasing the rate by 300 at $t = 24$, the well had been shut in, it would be assumed that a "negative" rate of 1,200 had been started at $t = 24$. Thus, Δp at $T = 32$ would be 415 — 384, etc. This is illustrated in a more practical way in the problems on buildup curve analysis.

7. Taking the constants of Problem 3, find the production as a function of time if the well were suddenly opened to 200 psi. drawdown and kept at constant pressure, $p_e - p_w = 200$. The production, from Equation 46, is related to the reduced production by:

$$Q\,(\text{res. cu. ft.}) = \mathbf{Q} \times 200 \times 2\pi \times 0.18 \times 0.000006 \times (0.3)^2 \times 30 = 0.0037\,\mathbf{Q}$$

As before, $\mathbf{t} = 1.5 \times 10^6\,t$. The calculation is as follows, taking $\mathbf{Q}$ from H, and v. E's tables or Chatas' Figs. 2-4.

t (days)	0.1	1	10	100	1,000
$\mathbf{t} \times 10^{-6}$	0.15	1.5	15	150	1,500
$\mathbf{Q}$	2.5×10^4	2.1×10^5	1.8×10^6	1.6×10^7	1.5×10^8
Q (cu. ft.)	92	780	6,650	59,200	555,000

For variable pressure, the ΔQ due to each pressure change is calculated assuming $t = 0$ when the change occurs, and this ΔQ added at the proper time to the Q calculated for the initial (assumed constant) pressure.

8. Assuming "steady state" pressure distribution, calculate the minimum radius at which the pressure would be equal to the initial pressure after 1 day, and then determine whether the rate, dQ/dt, calculated from the radial flow formula, agrees with that taken from curves. The average pressure (see Problem 1) is:

$$p_{av} = 1{,}500 - [(200/2)\,2.3 \log (r_e/0.3)]$$

This is related to the production by:

$$Q = \pi r_e^2\,hfc\,(1{,}500 - p_{av}) = 780$$

Simplifying and denoting the average pressure drop over the drainage radius by pd:

$$pd = \frac{780}{\pi \times 30 \times 0.18 \times 0.000006\,r_e^2} = 7.7 \times 10^6\,r_e^{-2}$$

From the other equation:

$$pd = 200/4.6 \log (r_e/0.3)$$

Plotting pd from the two equations against r_e, the correct value is given by the intersection as $r_e = 225$ ft. The instantaneous rate is:

$$dQ/dt = \frac{2\pi \times 0.22 \times 200 \times 30}{1.5\ c\ 2.3 \log (225/0.3)} = 835 \text{ cu. ft. per day}$$

Examination of the table of Problem 7 indicates that 835 cu. ft. per day is in line with the rate obtained from tables.

9. Using the constants of Problem 3, find the pressure drop at the well bottom as a function of time for a closed reservoir of external radius 3,000 ft., if the production is 1,200 reservoir cubic feet per day. For small values of t, the result is the same as if the reservoir were infinite (see Problem 3). This is evident by comparing Chatas' Fig. 9 with his Fig. 1. After the effect of the withdrawal becomes noticeable at the external boundary, the pressure distribution settles down to that given by Brownscombe and Collins (Equation 21) and the entire reservoir declines at the same rate. This is evident from Equation 44, in which $\Delta\mathbf{p}$ becomes a linear function of time as the latter becomes large. When $p_e - p_w$, p_e in this case meaning the original pressure, p_i, as calculated by Equation 44, becomes greater than p_i, the assumed rate can no longer be maintained. Chatas' Fig. 9 does not cover the "settling down" period for large values of r_e/r_w, but this portion of the time-pressure curve may be sketched in. Taking Equation 44 for large value of $\mathbf{t}$, and dropping the Bessel series, we obtain, on replacing reduced values by actual values:

$$p_i - p_w = \frac{qt}{\pi\,fc\,r_e^2\,h} + \frac{qu\,(\ln \mathbf{r}_e - \frac{3}{4})}{2\pi\,Kh}$$

which could also have been derived from the Brownscombe and Collins

Equations 18-31. The coefficient of t follows immediately from the reservoir pore volume and fluid compressibility. Substitution of the constants from Problem 3 $r_e = 3{,}000$ and $r_e/r_w = 10{,}000$ gives:

$$p_i - p_w = 1.31\,t + 368$$

It is apparent from Problem 3 that this does not hold for less than about 10 days. For 50 days and more we have:

t (days)	50	100	500	800
$p_i - p_w$	433	499	1,023	1,416
p_w (psi.)	1,067	1,001	477	84

The rate of 1,200 cu. ft. per day cannot be maintained for more than about 800 days. From Equation 35, it takes roughly 20 days for the "transient" to reach the outer boundary. If we take the last few values from Problem 3 together with the above table, we may piece the total time-pressure curve together.

10. If we consider the same closed reservoir (3,000-ft. radius), and the flux of 1,200 cu. ft. per day is maintained over a concentric circle of 1,000-ft. radius, the pressure drops at $r = 1{,}000$ may be obtained from H. and v. E's tables (Chatas' Fig. 9). With other constants from Problem 3:

$$\mathbf{t} = 0.22\,t/0.18 \times 6 \times 10^{-6} \times 1.5 \times 10^{6} = 0.136\,t$$

and, as before, $p_i - p_w = 45\,\Delta\mathbf{p}$. From the table (or figure) and $r_e/r_w = 3$, we obtain:

t (days)	1	5	10	50
t	0.136	0.68	1.36	6.8
$\Delta\mathbf{p}$	0.038	0.07	0.092	2.3
Δp (psi.)	1.7	3.1	4.1	103

For larger values of t, the pressure declines linearly with time (see Problem 9):

$$-dp/dt = \frac{q}{\pi (r_e^2 - r_w^2)\,fch} = 1.47$$

until the drop becomes equal to the initial pressure.

11. If a constant pressure 300 psi. below the initial pressure were maintained at the interior boundary, $r_w = 300$, and r_e, the closed exterior boundary were 3,000, we may find the cumulative flux Q over the interior boundary (see Chatas' Fig. 8).

$$\mathbf{t} = 0.22\,t/0.18 \times 6 \times 10^{-6} \times 1.5 \times 300^2 = 1.51\,t$$

$$\mathbf{Q} = \mathbf{Q} \times 300 \times 2\pi \times 0.18 \times 6 \times 10^{-6} \times 30 \times 300^2 = 5{,}500\,\mathbf{Q}$$

From tabulated values, we obtain:

t (days)	10	50	100	>500
t	15.1	75.5	151	>755
Q	10	30	42	49.50
Q (cubic feet)	55,000	165,000	231,000	272,000

The final value should equal $\pi (3{,}000^2 - 300^2) \times 0.18 \times 30 \times 6 \times 10^{-6} \times 300 = 272{,}000$ in agreement with that found from H. and v. E's tables.

12. Sometimes, when an oil pool is driven by expansion (and flow) from a large surrounding aquifer, there may be a constant pressure at the outer boundary of the aquifer. Assume, with the same constants as before, that $r_e = 30{,}000$ and $r_w = 3{,}000$ and the flux over r_w is 1,200 cu. ft. per day.

$$\mathbf{t} = 0.22\,t/0.18 \times 6 \times 10^{-6} \times 1.5 \times 3{,}000^2 = 0.00151\,t$$

$\Delta p = 45\,\Delta\mathbf{p}$ from Problem 3

For the smaller values of **t**, $\Delta\mathbf{p}$ is the same as for an infinite system (Fig. 4). For larger values they are taken from H and v. E's tables or Chatas' Fig. 11:

t (days)	100	1,000	10,000	30,000	60,000
t	0.151	1.51	15.1	45.3	90.6
$\Delta\mathbf{p}$	0.4	0.96	1.83	2.2	2.303
Δp (psi.)	18	43	82	99	103

Up to $\mathbf{t} = 25$, the pressure drop is the same as if the system were infinite. When **t** is over 90, the system is steady state, and there is no further pressure drop at the inner boundary. The limiting drop is readily checked with the simple radial flow formula:

$$\frac{2\pi \times 0.22 \times 30 \times 130}{1.5 \times 2.3} = 1{,}200$$

13. From the buildup curve of Fig. 8, let it be required to find, in addition to the permeability, the shut-in reservoir pressure, and the "skin effect" around the well, by the method of Miller, Dyes, and Hutchinson. If the viscosity is 1.5 cp., the formation volume factor 1.4, the daily production 1,200 stock-tank barrels and the sand thickness 30 ft., the permeability in millidarcies is (Equation 62).

$$K = \frac{163 \times 1{,}200 \times 1.5 \times 1.4}{110 \times 30} = 125 \text{ md.}$$

If $r_e = 1{,}000$, **t'** is found from Equation 54 to be 0.204 when $t = 10$, taking $f = 0.18$, $c = 6 \times 10^{-6}$. Then if $r_e/r_w = 4{,}000$, $\Delta\mathbf{p}'$ is 6.8 from Equation 58. Then from Equation 55:

$$p_w - p_{wi}^* = \frac{6.8 \times 1{,}200 \times 1.5 \times 1.4}{0.00707 \times 30 \times 125} = 647$$

At $t = 10$, $p_w = 1{,}380$, whence $P_{wi}^* = 733$. If the actual initial bottom-hole pressure were 900 psi., the skin effect would be positive and equal to 167 psi. The static reservoir pressure is found (theoretically) from Equation 63:

$$p_e = 733 + \frac{1{,}200 \times 1.5 \times 1.4 \ln 4{,}000}{0.007 \times 30 \times 125} = 1{,}520 \text{ psi.}$$

14. The methods of Horner and van Everdingen are shown directly on Fig. 10, for the case of an infinite drainage area. The calculations of the permeability and of the final buildup pressure are shown on the figure. If h is 30 ft., $\mu = 1.5$ cp., $q = 500$ cu. ft. per day:

$$K = \frac{2.3 \times 500 \times 1.5}{4\pi \times 30 \times 4.9 \times 14.7} = 0.063 \text{ perms or } 10 \text{ md.}$$

and $p_e = 126$ atm.

If $f = 0.18$, $c = 6 \times 10^{-6}$ per psi., $r_w = 0.3$ ft., $T_1 = 0.2$ day, then, from Equation 66, if $p_w = 108$ when $T_1 = 0.2$ day (time of shut in):

$$14.7\,(126 - 108) = \frac{500 \times 1.5}{4\pi \times 0.063 \times 30} \times \left[\ln \frac{0.063 \times 0.2}{6 \times 10^{-6} \times 0.18 \times 1.5 \times 0.3^2} + 0.81 + 2S \right]$$

The skin effect in psi. is $500 \times 1.5 \times S/2 \times 0.063 \times 30$ which from the preceding equation is —119 psi.

Applications to the Material-Balance Equation

15. In the analysis of a field performance by means of the material-balance equation, it is often necessary to determine the total water influx. In

trying to find this, the influx may be calculated using various values of the fluid and field constants and the known pressure drops as a function of time, until consistent material balances are obtained. The total influx is estimated by superposing the cumulative fluxes due to succeeding pressure drops over the proper time interval. This may be illustrated by a problem, taking the porosity, permeability, viscosity, and compressibility again from Problem 3. Assume that h = 30 ft., the field radius 3,000 ft., with an aquifer large enough to be assumed infinite for the time span involved. Instead of stepwise superposition, continuous superposition will be used. The pressures are as follows:

t (days)	0	366	731	1,096	1,461
p	4,225	4,145	3,900	3,620	3,340
Δp	0	80	325	605	885
1,461 — t	1,461	1,095	730	365	0

The reduced time **t** is:

$$t = 0.22\ (1{,}461 - t)/0.18 \times 6 \times 10^{-6} \times 1.5 \times 3{,}000^2 = 0.0151\ (1{,}461 - t)$$

The reduced flux is:

$$Q = \mathbf{Q}\ \Delta p \times 2\pi \times 0.18 \times 6 \times 10^{-6} \times 30 \times 3{,}000^2 = 933\ \mathbf{Q}\ \Delta p$$

The total flux after 1,461 days is then given by:

$$Q\ (\text{cum.}) = 933 \int_0^{885} \mathbf{Q}\ d\ (\Delta p)$$

Completing the table, and taking values of **Q** from H and v. E (or Chatas' Figs. 2-4):

t	22	16.5	11	5.5	0
Q	13	10	8	5	0

Evaluating the integral graphically as about 5,300, gives the cumulative water influx after 1,461 days as 5×10^6 cu. ft. If the influx is only over a part of the field periphery, values must be multiplied by the proper fraction.

How Casing Was Run on World's Deepest Producer

by D. H. Stormont
West Coast District Editor

COMPLETION of Richfield Oil Corp.'s deeper zone test late last year in a 17,800-ft. North Coles Levee condensate zone—a new world's producing depth record—involved running 17,500 ft. of 7-in. casing.

This length of 7-in. is believed to be the second longest string ever run. Only the 19,765 ft. of 7-in. cemented in Superior Oil Co.'s deep test at Green River basin, Wyoming, in May 1949 is thought to have been longer.

While stabbing a length of casing the tong operator stands by in readiness to spin it in and tong it tight with air-operated tongs. Torque as high as 10,000 ft.-lb. was applied.

Designated Richfield 67-29 C.L.A., the new producing-depth holder was completed flowing 119 bbl. of 43°-gravity condensate daily. Flow was through an 18/64-in. choke. The 5-in. liner which had been landed at 17,892 ft. contained perforations at 17,497-17,892 ft.

Production has declined quickly so that the well probably is uneconomical. It did, however, establish Eocene sand production in southern central San Joaquin Valley. Further drilling in an effort to locate these sands at a better structural position is anticipated because of the well's performance.

Casing was run at an average rate of 2 minutes per length, or 1,174 ft. per hour. Elapsed running time of 15 hours did not include an additional 5¼ hours required for installing new lines, changing the casing spider, and other incidental delays.

It was made up of 442 lengths of Spang extreme line casing, principally 32, 35, and 38 lb. per foot. Calculated safety factors for both tension factors and collapse pressures were low because of the exceptional length of casing and depth of hole. Running performance of the casing was satisfactory, however.

Casing centralizers were installed on the bottom two joints. A Baker differential fillup whirler shoe was placed on the bottom of the first joint; on the bottom of the second, a differential fillup collar. These permitted 81 per cent fillup of the pipe with mud as it was run.

Internal parts of the differential shoe and collar are such that the manufacturer does not recommend their being run below a point which would give 10,000-psi. hydrostatic head. At this pressure there is a possibility it would not be possible to release the back-pressure valve. For this reason it was decided to trip the valves at 11,000 ft. From this point on the differential shoe and collar performed as a conventional float shoe and collar.

The string of casing was handled by ten 1⅜-in. lines. Maximum load was 430,000 lb. when the last length had been run and the string was completely filled with mud. The string was run in oil-base mud which weighed 116 lb. per cu. ft. It thus carried an additional 173,000 lb. of the total weight of the string, which was 602,890 lb.

Air-operated tongs, which contributed to the ease and speed of installation, were used by the casing contractor to tong up all joints. They were tonged up by shouldering at a torque of 1,800 to 2,000 ft.-lb. in high gear, and then shifting to low gear to apply tightening torque. From 5,000 to 7,000 ft.-lb. was applied at first. As the work progressed the torque was increased to 10,000 ft.-lb., full capacity of the tongs. This "soft" power apparently did not harm the joints.

The casing was run into a 10⅝-in. hole through 11¾-in. casing set at 6,500 ft. It was cemented up to the bottom of the protective string, using about 3,000 sacks of cement. This volume was expected to fill the hole some 9,000 ft. above bottom; temperature tests showed it to extend a little above this calculated height.

Flexibility in Refining Processes . . .

. . . a three-part discussion on how to achieve this important factor in process design, and considerations in refinery revamp work

by Gerald L. Farrar
Engineering Editor

PETROLEUM-REFINING operations are changing rapidly, and changes in a unit are often indicated soon after it goes on stream for the first time. Too, as new and better processes are developed, the need often arises to revamp an older unit to handle a new process.

For these reasons, process flexibility and revamp considerations are becoming more important to the refiner.

This article was written using papers and informal discussions from the recent annual national meeting of American Chemical Society in Kansas City.

Papers used in compilation of this material include: (1) Engineering Considerations in Plant Revamp Work, by J. M. Black, M. W. Kellogg Co., New York; (2) Flexibility in Refinery Process Design, by J. W. Packie and D. L. Campbell, Standard Oil Development Co., Elizabeth, N. J.; and (3) Reserve Flexibility in Design of Oil-Refining Processes, by D. J. Berman, Universal Oil Products Co., Des Plaines, Ill.

. . . 1. In Revamping Old Units

The majority of so-called "revamp" projects in oil refineries basically involve plant-capacity increase by enlargement or modernization of equipment to remove bottlenecks. There are also many projects where the feed and/or product characteristics are altered, sometimes by established means and other times by completely new process approaches. The following are typical:

1. Existing cat cracker vapor-recovery unit revamped for greater propylene production to produce improved aviation-gasoline blending stock and ethylene feed stock for petrochemical processes.

2. Portion of combination thermal cracking unit revamped into vacuum distillation unit to supply cat cracker feed stock.

3. Portion of combination thermal cracking unit revamped into an atmospheric distillation unit to supply highly fractionated straightrun distillates plus reduced-crude feed to a vacuum unit for cat cracker feed stock.

4. Entire HF alkylation aviation-gasoline plant built for Defense Plants Corp. during war converted to lube-oil plant.

A general approach for assembling a cost figure covering a revamp involves these steps: (1) preliminary process study, (2) roundup of data on existing plant, (3) detailed process study, (4) survey of equipment condition, (5) survey of auxiliary facilities, (6) study of land and construction costs, (7) cost of shutdown time, (8) labor considerations, (9) obsolescence of machinery and instruments, (10) detailing engineering, and (11) estimate summary.

Preliminary process study . . . This preliminary step must include a plant survey to determine the availability of an outmoded unit which will provide most of the equipment required by the new process, the elimination of which can be (or has been) accomplished by alterations and/or additions elsewhere in the plant. Furthermore, the preliminary process study must indicate that principal towers, furnaces, exchangers, etc., appear to have sufficient potential duties and capacities, and that sufficient space is available for necessary additions.

One of the most important items in determining the authenticity of the evaluation figures is the extent and accuracy of mechanical design and operating data concerning the existing unit. This might appear to be routine matter, however, it is amazing how plant records concerning equipment 10 years old and older are either completely absent or so meager as to be unreliable.

This is usually attributable to:

1. Durable original prints or tracings were either never received or not kept under responsible custody, and therefore change records are completely absent. Equipment has been added or eliminated; lines rerouted, etc., with no engineering record other than miscellaneous instructions to the maintenance department. The original contractor's drawings hence become quite unreliable.

2. Performance and repair records covering pumps, drivers, pressure and heat-exchanger equipment, etc., are apt to cover only the most critical services in the existing operation. Corrosion measurements are apt to be available only for pipe and vessels in hot and high-pressure, or highly corrosive service. For the remaining equipment, one must either assume or find out how closely it resembles the original installation.

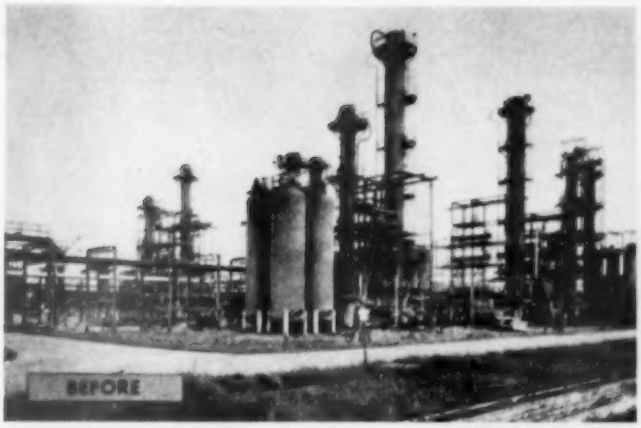
Major equipment locations should be rechecked for absolute accuracy of dimensions.

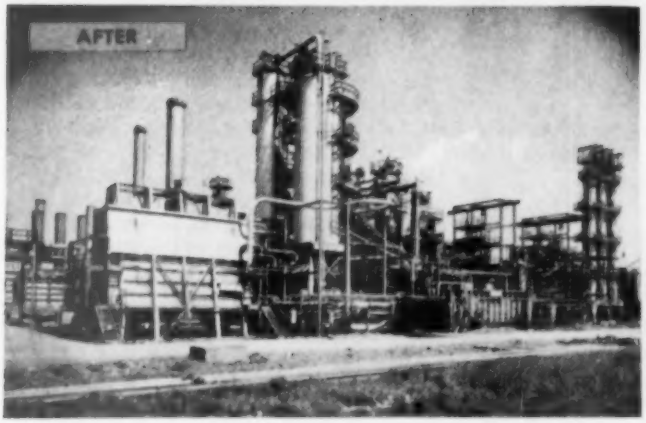
Tower data . . . One of the most difficult items to obtain concerns internals of towers and exchangers. Yet process engineers must have all data concerning tower trays, i.e., depth of seals at bubble caps and seal pots, cross-sectional areas of bubble-cap slots, details of downflows, weirs, and inlet distributors.

A heat-exchanger evaluation for new service is useless unless all details of the tube-layout, baffle-spacing, and free-area data are at hand.

Pump-characteristic curves for centrifugal pumps should be available—not the vendor's original quotation curve, but the actual plotted test curve. This item is of great importance because the pump that was purchased for the original service may have been finally designed with an excessively large safety factor to allow for unknown process variables in the original setup.

Furnace-tube header arrangements

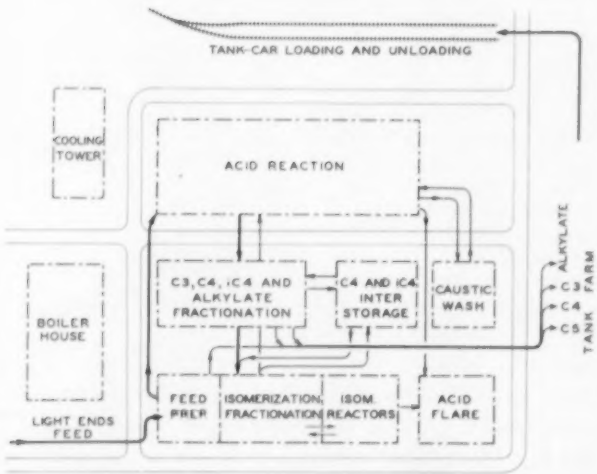




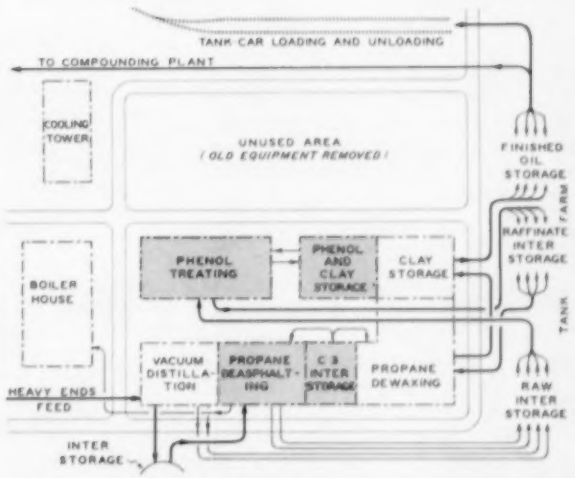
TYPICAL PLANT REVAMP operations are exemplified by the conversion of an HF-alkylation unit to a lube plant at a Mid-Continent refinery of Phillips Petroleum Co. These photographs show the modification of the southwest portion of the isomerization unit in the alkylation plant to provide vacuum distillation, propane fractionation, and deasphalting units for the lube plant.

MOST DRAMATIC CONVERSION in the revamp of the Phillips alkylation unit is found in the phenol-treating section, shown here. Foundations, steel work, and vessels were for the most part left in position while internals were redesigned. Extract furnace occupies foundation used by heater shown in top photograph. Storage drums were left virtually unchanged, except for coat of paint.

Revamp Utilizes Equipment, Space Efficiently and Economically



EQUIPMENT AND SPACE were utilized efficiently and economically in the alkylation unit revamp, as may be seen from flow plan of the alkylation unit at left and that of the lube plant at right.



Shaded areas on lube-plant flow sheet represent equipment adapted from alkylation unit with comparatively little change. Substantial savings over new-unit cost were effected by revamp.

also have a habit of becoming rearranged over the years and, of course, an evaluation of the usefulness of a furnace for a new duty relies again on accurate information.

Once the basic mechanical information has been assembled, the process engineer may proceed with detailed fractionation, heat-distribution, pressure-drop, pumping and storage studies.

Equipment survey . . . After basic reusable equipment has been pinpointed from a process angle, it becomes necessary to restudy the actual physical condition of the equipment.

The matter of condition of pressure shells on vessels generally turns out to be the easiest one because fairly accurate records are usually kept. Also, the practice is normally to reuse vessels in the new process in services that present somewhat less-severe pressure and corrosion conditions than those for which the vessels were originally designed.

The greater problem lies in trying to estimate the condition of the piping. This is particularly true with plants built between 1941 and 1944. It is safest to use allowable stresses of welded pipe only on wartime-constructed plants. If new service conditions are to be substantially higher than the existing operation, a careful inspection program of sentry holes or audio gaging is in order.

The condition of pump cases should be known. Situations have occurred where a particular existing pump was selected for a new service and when the pump was disassembled for the addition of a new impeller, it was found that the case was pitted beyond the point of safety.

A careful study of joints and shear points should be made on structures that are beginning to show any signs of deterioration before any new or greater loads are planned on. Refining of furnace walls, ceilings, breechings, or stacks should also be considered at the time of revamp.

Auxiliary facilities . . . A survey of the main plant auxiliaries should be undertaken. Most are already apt to be available. However, unless all factors are considered, the evaluation study can become quite inaccurate.

The lack of reexamining the less glamorous auxiliaries, such as sewer-collecting and disposal systems, the slop, and blowdown and flare systems, can result in unexpected cost extras, startup delays, and possible public nuisances.

Invariably the new plant will result in different-type water-contaminating wastes that will require a redistribution of the collecting system. Digging up of existing sewers and relaying of new ones around existing foundations can be very costly. This consideration should be emphasized during the spotting of equipment. Settlers will have to be reexamined for the new quantity and quality of the sewerage.

The new plant will undoubtedly contain a different proportion of heavy vs. light ends, meaning the blowdown-stack vs. flare-stack distribution is apt to change. Many old crude stills which need revamping are buried in the middle of the refinery. Routing of a new flare line from this central location to a remote site beyond the tank farm can become expensive and must not be overlooked in the budget.

Construction costs . . . Lack of working space can double the cost of what otherwise would be a routine operation. On a new, clean site, the construction sequences can be worked out in advance in a logical manner to allow easy movement of large equipment to the lifting rigs. The routing of a new tower into a crowded existing unit will require an immense amount of planning and will often necessitate the temporary relocation of existing equipment that otherwise would be undisturbed.

The redesigned unit has been conceived to increase the over-all profit made by the refiner. But let us assume that the existing unit is still in operation—and that upon its running depends the operation of a number of other subsequent units in the chain of refining within the plant. If this is true, then the length of down time of that unit can become crucial.

Two actions can be taken to cut this time. One, obviously, is working overtime, the other is to field fabricate as much pipe as possible. This may not seem expensive; however, it will require many more break flanges and unions. This in turn requires more careful detailing of the pipe. Nearly every line will have to be checked in the field for exact dimensions before release to the shop fabricator.

Another factor not to be forgotten is the matter of how long and where burning and welding can be tolerated at the site. The unit to be revamped is likely to be close to an operating unit handling highly volatile hydrocarbons. The refinery safety department may not permit welding within an area that may encompass the new alteration project. Careful liaison and preplanning can save money and a possible conflagration.

These items that affect shutdown time are vastly important. It can be found that doubling of the labor budget, combined with careful planning of shutdown time to coincide with other unit routine turnarounds, will more than pay off.

Obsolescence . . . An important question in the revamp is whether to update outmoded equipment such as pumps, driers, filters, and the more general category of control and recording instruments. Serious consideration should be given to modernization. A check with the maintenance and operating departments may bring out facts and figures which will indicate that the matter of obtaining replacement parts for obsolete controllers is becoming an increasingly difficult problem.

Detailing of revamp . . . The chances are slim that the main engineering office is near or even in the same town (or state) as the job site. If a small competent engineering group is available for checking all phases of the existing plant at the job site, its services should definitely be planned on, with adequate allowance for traveling expenses included in the engineering budget.

Estimate summary . . . The contingency figure must be high in an estimate covering a revamp. There will always be hundreds of little unforeseen items that will crop up until the actual work is started, such as:

The removal of a tower tray that bares the fact that the tray's support ring is practically corroded through, or that the tray was welded in place instead of being bolted.

The digging of a trench that unearths a vital sewer line or power line not known to have run through that area.

The disassembling of a pump that indicates that a complete new mechanical seal is required.

Ample allowance for contingency should thus be made.

"The greater problem lies in trying to estimate the condition of the piping. This is particularly true with plants built within 1941 and 1944. It is safest to use allowable stresses of welded pipe only on wartime-constructed plants."

. . . 2. In Refinery-Process Design

The major broad categories for which flexibility in refining process design must be evaluated are:

1. A reasonably variable crude type and source.
2. Products in realistic number, quantity, and quality.
3. The optimum number and choice of processing units.
4. A suitable range of operating conditions such as temperature, pressure, yields, heat inputs, etc.
5. Adequate provision of equipment to assure meeting the requirements of the design service factor and economic maintenance.

Crude Type and Source

The designer should consult with the marketing and producing interests to see what limited number of crudes deserve most consideration. Economic studies should be made to determine the actual investment and operating costs for running each type of available crude, and from these data, estimates of the profit margin should be made.

If it is desired to provide for running two different crudes of about the same boiling range, one sweet and the other sour, it becomes necessary to provide additional processing steps to remove the sulfur compounds from the products. In addition, corrosion protection, such as the use of a considerable amount of alloy must be provided throughout the refinery where the sulfur compounds would cause trouble.

The investment increase for a sour-crude refinery is on the order of 2.5 per cent more than the investment for a sweet-crude refinery of the same capacity of 50,000 bbl. per calendar day. This cost increase reflects only the additional investments and materials requirements for corrosion protection, with a minor adjustment for caustic treating gasoline. It is assumed that the same products are made from both crudes, but the 2.5 per cent increase does not include the additional treating which would certainly be necessary to make kerosine from a sour crude.

If a unit were also provided to make specification kerosine, the investment increase for the sour-crude refinery would go up to approximately 8.5 per cent. The operating cost of the refinery would also increase to reflect the additional investment and some added manpower.

If a refinery is to be able to alternate between light and heavy crudes and at the same time meet similar market requirements, a different kind of flexibility is needed. Additional equipment must be provided for the heavier crude to crack some of its higher-boiling cuts to lighter-boiling cuts. The refinery which can run either light-sweet or heavy-sour crude will cost considerably more than a refinery designed for light-sweet crude only.

TABLE 1—SWEET VS. SOUR CRUDE—GULF COAST REFINERY

Refinery capacity, bbl. per calendar day	50,000	50,000
Crude type	Sweet	Sour
Refinery investment, millions of dollars	34.3	35.2
Salable products, liquid volume per cent on crude:		
Gasoline	48	48
Kerosine	5	5
Middle distillate	20	20
Residual fuel oil	21	21

The additional cost can sometimes be justified on the basis that such added flexibility permits the refiner to pick the cheapest crude to run at specific times, and allows him to produce products which take advantage of seasonal or abnormal prices and demand fluctuations.

Product Requirements

The best way to work out a product flexibility problem is to have the designers indicate the incremental cost of providing incremental product volume capacity or storage, incremental product quality and incremental product variety, and then have the refiners and marketers choose some reasonable stopping point.

The problem of flexibility in connection with product-yield structure and quality considerations rises daily in refinery-planning work. This problem in turn revolves around process-unit flexibility and whether it is costly or profitable. The example in Table 2 applies to a whole new refinery.

Base Case A is a simple refinery with conventional processing equipment. The gasoline pool octane number is about 90 C.F.R.R. at the 2-cc. TEL per gallon level. About 510 bbl. per calendar day (fuel-oil equivalent) of fuel gas is produced above refinery-fuel requirements.

To utilize the excess gas and to provide more gasoline octane-number flexibility, Case B was considered. The case contains the same type of process equipment as Case A, except that a polymerization plant to convert light olefins to gasoline has been added. This permits reducing the crude rate and catalytic cracking feed rate, while still making the same quantities of all products except bunker fuel oil. No excess gas is made, and the gasoline pool octane number can be reached with 40 per cent less TEL. For future demands, using the full amount of lead will permit going to 92-octane number.

This flexibility is obtained by a 16 per cent increase in capital investment. The per cent return on the incremental investment in 15.8 per cent. Thus in this case the addition of flexibility actually shows a profit and there are no counterbalancing disadvantages except, of course, larger capital requirement.

The third case included in Table 2 as Case C demonstrates a different type of flexibility, which can be called product-capacity flexibility. An additional processing unit has been included in this refinery to permit the production of 1,340 bbl. per calendar day of kerosine, for which it is assumed there is a good market. To do this without reducing the yield of other salable distillate products necessitates an additional crude feed of 2,700 bbl. per calendar day over Case B. Besides the kerosine, bunker-fuel-oil production has increased 1,170 bbl. per calendar day over Case B. All major processing units

TABLE 2—PRODUCT YIELD AND QUALITY FLEXIBILITY

Case—	A	B	C
Crude capacity, bbl. per calendar day	21,400	19,800	22,500
Description	Base case no poly or kerosine plant	Base case plus poly plant	Base case plus poly and kerosine plant
Investment, million dollars	15.5	18.0	20.5
Product yields, bbl. per calendar day:			
Gasoline and jet fuel	9,640	9,640	9,640
Kerosine	0	0	0
Diesel, varsol, asphalt, etc.	2,560	2,560	2,560
Bunker fuel	8,080	7,170	8,340
Excess gas	510	0	0
Total	20,790	19,370	21,880
Profit, dollars per calendar day	5,860	6,940	7,680
Per cent return on incremental investment		15.8	13.3

are increased about 13 per cent in capacity over Case B.

For a refinery to have both product-capacity (kerosine) and octane-number flexibility, the investment increase of Case C over Case A is about 32 per cent. The return on the incremental investment is about 13.3 per cent. For this study, flexibility pays a certain return and the higher investment for the most complete case would be given corresponding consideration.

Selection of Process Units

To meet the previously determined product requirements when processing the selected varieties of crudes, a certain combination of processing units can be employed. A number of competitive units are available and, in arriving at the optimum design, the applicability of these competitive units and their compared economics should be considered.

In evaluating the proper balance between optimum process investment and desired flexibility, the designer has a basic choice between a refinery with conventional process units or a catalytic - combination - unit refinery. Depending upon location, size, and product requirements, the decision may go to either type refinery. In general, if the refinery management is willing to lose some flexibility in product yields and quality, the combination-unit refinery can be built for considerably less capital investment than that required for a conventional refinery.

An example set up to illustrate this point covers a 25,000 bbl. per day prime-fuel refinery running sour crude. The product yields for the conventional processing unit refinery, which includes additional facilities to increase light products and reduce fuel, are such that the product credits are about 21 cents per barrel higher than for the combination-unit refinery. However, the combination-unit refinery can be built for about a third less capital investment cost than the low-fuel conventional refinery, and involves 30 per cent lower operating cost.

Against these substantial savings, the greater flexibility of the conventional refinery with vacuum distillation, visbreaking, and polymerization is evaluated, and the combination unit looks quite attractive.

In the above case, the conventional refinery contained visbreaking and polymerization processes, which makes for an unusually complete refinery with maximum flexibility but a higher cost.

After selecting the type of refinery and the processing units, consideration should be given to the number of individual units for each process. For instance, the initial distillation could be carried out in a single pipe still or in two or more pipe stills in parallel. In most cases studied, the authors have found a minimum number of units to be desirable from an economic standpoint. In other words, blocked operations in a single unit are generally preferred to parallel operation in duplicate units.

It should be pointed out that the single unit operation requires additional feed and product storage. However, total investment and labor costs are minimized.

There are exceptions to the generalization that a single unit is cheaper than duplicate smaller-sized units. For instance, where the quality of feed processed or the products required vary widely, the use of parallel units may become attractive. Thus it can be shown for a lube-treating unit that in some cases solvent rates may vary widely for the production of different-quality lubes.

By classifying the operations according to high and low-treat operations, it is possible in some cases to design a unit with two treating and raffinate-recovery sections and with a common extract solvent recovery section. This design permits lower investment and operating costs than a unit with single treating and raffinate-recovery sections. In this case, increased flexibility is obtained with less tankage and a lower total cost.

Range of Conditions

In the design of any specific process unit, a range of process variables should be considered. The advantages of flexibility in operating conditions must then be balanced against the cost of providing this flexibility. The fluid catalytic cracking unit provides a good example of a unit for which a careful study of operating conditions is necessary before a final design is set.

Assumed that the optimum reactor pressure has been set. Consider the variable of reactor temperature, for which two cases at 900° and 950° F. are seen in Table 4. Flexibility in this example shows little advantage. A unit which can operate at either temperature requires a 12 per cent capital-investment increase and a 5 per cent operating-cost increase, with only a 1 per cent product credit for the best case.

In addition, although the 950° F. reactor temperature case shows an 8 per cent return on the incremental investment over the base case, a flexible unit which can run at either temperature shows only about a 2 per cent return on the incremental investment when making the optimum product distribution.

In setting up the process conditions for almost every refinery-process unit, economic studies such as these are a necessity. It is advantageous to have a process unit with some built-in flexibility because feed stocks are constantly changing and the optimum process conditions for one feed stock may not be the best choice for another feed stock. Any method that achieves flexibility without adding too high an investment should be incorporated into the process

TABLE 3—CONVENTIONAL VS. COMBINATION UNIT, REFINERY FLEXIBILITY

Capacity, bbl. per calendar day	25,000	25,000
Investment, millions of dollars	24.5	16.0
Type	Conventional*	Cat. comb. unit
Product yields, liquid volume per cent:		
Gasoline	48.0	45.0
Kerosine	10.0	10.0
Gas oil	23.0	15.0
Fuel oil	18.0	29.0
Salable prod. credit, per bbl.	$4.20	$3.99
Oper. cost, per bbl.	$0.88	$0.62

*Inciudes vacuum distillation, visbreaking, and polymerization.

TABLE 4—REACTOR-TEMPERATURE FLEXIBILITY

Reactor temperature, °F.	900	950	Flexible unit
Process investment, million dollars	6.38	6.76	6.92
Incremental process investment, million dollars		0.38	0.54
Incremental other investment, million dollars		0.16	0.23
Total incremental investment, million dollars		0.54	0.77
Incremental production credits, dollars per calendar day		331	331
Incremental operating cost, dollars per calendar day		209	292
Incremental profit, dollars per calendar day		122	39
Incremental profit, dollars per year		44,500	14,350
Per cent return on incremental investment		8.2	2

design; flexibility which entails considerable investment must be economically justified.

Service factor . . . It is necessary to provide some additional equipment beyond that required for the normal process requirements to allow for maintenance work, including cleaning and repairs on certain types of equipment. Also, special materials may be desirable in some operations to insure against equipment failure during upset periods when temperatures, corrosivity, or other process characteristics may deviate from the normal.

Compressor study . . . This summarizes a cost study which shows justification for a spare compressor in a low-pressure cracking unit. Gas-engine-driven compressors for handling the products are preferred over centrifugal units for the size of unit assumed. Three gas-engine-driven units are selected for normal operations. The pertinent data and calculations involved in justifying a fourth compressor are:

1. Incremental value of products = 6.52 cents per pound.
2. Loss of product if one compressor (of three) comes down = 3,460 lb. per hour.
3. Design service factor for entire plant = 82 per cent.
4. Design service factor for compressor (during plant onstream period) = 95.5 per cent.*
5. Loss per year due to compressor down time if no spare available = 3,460 × 364 × 24 × 3 × 0.82 × 0.045 = 3,360,000 lb. per year. 3,360,000 × $0.0652 = $219,000 per year.
6. Differential compressor cost four units vs. three = $150,000.
7. Differential yearly operating costs four units vs. three = $16,800.
8. Return on investment for spare

$$\text{compressor} = \frac{\$219{,}000 - \$16{,}800}{150{,}000}$$

= 135 per cent.

It may be desirable in some cases to modify the design of equipment from the process optimum in order to minimize maintenance expense. For example, the spacing between the convection tubes in a furnace may be determined by the requirements for cleaning during the shutdown rather than by heat-transfer considerations. This may result in some increase in furnace cost due to a lower heat-transfer efficiency. However, it can be justified by the resulting easier maintenance in refineries where the flue gases have a high solids content and a resulting severe tube-fouling problem.

*Based on other experience with similar compression plants.

Flexibility

. . . 3. In Reserve Equipment

The process designer, in setting specifications for equipment to compare with what might be considered the normal operating condition, must allow for a certain amount of flexibility simply to have the process operate as desired with the yearly variations in climate affecting operating conditions.

These variations occur due to changes in water temperature and radiation loss. In addition, flexibility should be provided for the unit to accommodate variations in feed composition and product specifications.

These points can be illustrated by considering the condition surrounding some of the individual pieces of equipment.

Pumps . . . Of all of the possible reasons for failure to meet expected plant capacity, the least excusable would perhaps be inadequate capacity of the charging pump.

Furthermore, this would be the most exasperating bottleneck to encounter if all other equipment were capable of handling a slight increase in capacity. Consequently, it has been fairly common practice in the petroleum industry to specify a charge pump for 10 to 25 per cent over the normal expected charge rate. This should not be considered as purely reserve capacity because corrosion or erosion or necessity of opening up wear-ring clearance may result in enough internal leakage to absorb a good part of the extra capacity provision.

However, just providing for addition capacity does not always provide the reserve desired. The operating pressure of the pump must be considered for a turbine or motor drive to have sufficient power to handle the increased capacity. In the case of a fixed-pressure discharge, the driver would require the same percentage reserve as the pump itself.

In the case of a friction load on the pump, the pressure drop would increase with the square of the velocity or capacity, and the power with the cube of the capacity. Thus, a 10 per cent increase in pump capacity requires approximately 20 per cent increase in pump head and 30 per cent increase in driver horsepower.

Steam-driven reciprocating pumps are ordinarily made in stock sizes and often have a fairly large reserve ratio of operating pressure to stalling pressure. However, in cases of high-pressure application, stalling pressure might interfere in the event of a friction load and thus should be considered. Reciprocating pumps particularly are subject to worn pistons, leaky valves, short stroking, and other weaknesses which affect capacity. So it pays to have some reserve, especially for hot or abrasive service.

Other pumps throughout the system, such as reflux pumps, slurry pumps, etc., should be considered from the standpoint of giving maximum duty in the case of adverse conditions, rather than simply providing additional capacity for the base case. For example, a reflux pump, to do a given amount of cooling at the top of a fractionating column, requires more capacity when the water temperature and temperature of the reflux in the receiver go up.

As another example where the ignorance factor is the major one, consider a circulating heat-removal stream in the lower part of a fractionating column. The heat removed is directly dependent upon the stream temperatures, and these cannot be heavily relied upon because of change with composition and with size of circulating stream. Here the range in capacity for satisfactory operation may be from less than half to double the normal flow in some cases.

Exchangers . . . Use of fouling factors has become fairly well standardized through the Exchanger Manufacturers' Association standards. This allowance sometimes results in a considerable overcapacity for the equipment in the clean condition. The designer also sets the duty by specifying a given terminal temperature difference which is usually the most critical factor in determining the size of the exchange equipment.

For instance, a condenser provided with water between a temperature of 85° and 130° F. is intended to cool gasoline down to a temperature of 95° F. In a clean condition, if the normal amount of water be used, the received temperature may be only 92° F. On the other hand, if the condenser is operating in its normal condition with a certain amount of fouling, but the terminal temperature difference is allowed to increase to 12° F., a fair increase in capacity will result because of the higher available mean-log temperature difference and higher heat-transfer resulting from increased velocities of both water and gasoline vapor.

The transfer rate for a given film

will increase with the 0.8 power of velocity. If the velocity increases on both sides of the surface, the over-all transfer rate will increase nearly in proportion.

Accordingly, reserve capacity is seldom provided in exchange equipment except through these factors of fouling coefficient and increasing heat-transfer rate with increased capacity. Furthermore, exchange equipment is usually quite adaptable to the installation of additional units, which may be duplicates or varied as necessary.

Specification of pressure drop in exchangers plays an important part with respect to reserve capacity. If the pressure drop is high to start with, which tends to result in a high transfer rate per square foot on a given piece of equipment, small changes in capacity may cause undesirable pressure drops which must be absorbed by a corresponding decrease in ΔP in the control valves or in the available reserve pressure in the pumps.

Compressors . . . Compressors, like pumps, must be considered from the viewpoint of summer vs. winter duty, and the specifications set up on the design case using warm water in the summertime with maximum gas production, must be coordinated with the winter case by providing clearance pockets, valve lifters, etc.

Compressors, like pumps, are subject to valve breakage and valve or piston leakage, so that 10 per cent reserve in capacity is desirable simply to meet the required conditions after a long period of service.

Centrifugal compressors are subject to one additional degree of freedom which can seriously affect their performance; that is, the dependence of the discharge pressure on molecular weight of gas which, in turn, affects the dependent variables' horsepower and capacity. Accordingly, maximum conditions should be carefully surveyed and a decision made on whether the compressor should be required to meet the desired duty under adverse conditions, or whether if the density of the gas decreases beyond a given value, plant operation will not be too severely handicapped by a drop in discharge pressure as a temporary measure.

Fractionating columns . . . General improvements in methods of design have resulted in the realization that a well-logged bubble tray can operate satisfactorily at rates considerably over 50 per cent higher than the Brown-Souders formula would indicate.

This holds true especially in the medium range of pressures from atmospheric up to perhaps 50-75 psig. High-pressure towers such as stabilizers, where the vapor density is appreciable, should be held closer to the formula.

"As a general rule, bubble-cap columns have a wider range of capacity with good operating efficiency than perforated-plate columns, and are preferred where operations may vary considerably."

Further, there has recently been a realization of certain advantages in the use of perforated-plate or grid towers which can operate at still higher rates above bubble-cap towers.

As a general rule, bubble-cap columns have a wider range of capacity with good operating efficiency than perforated-plate columns, so the bubble caps are preferable where operations may vary considerably.

Of importance in designing fractionating towers generally is consideration of the type of load, whether high liquid and low vapor, or large volumes of vapor compared to liquid, as in a vacuum column.

Since the fractionating column is one of the large and critical pieces of equipment in a plant that is difficult to enlarge or replace, its initial design should be considered from the standpoint of possible future capacity.

Heaters . . . Heaters, like heat exchangers, usually inherently have a certain amount of flexibility because increased throughput decreases the initial film drop and allows higher heat-transfer rates and capacity with consequent higher-pressure drop and lower fuel efficiency. It is common practice to design heaters with nominal over-all heat-transfer rates for extended operation.

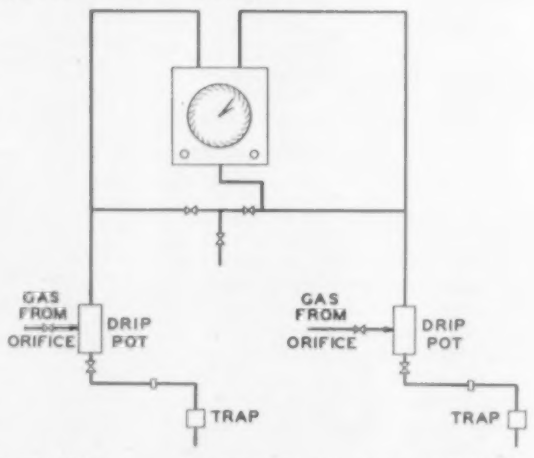
In all process design, this matter of reserve capacity should preferably be considered from an over-all viewpoint rather than from adding up a series of relatively small safety factors. The latter can result in an unnecessarily costly, oversize unit and sometimes in unsatisfactory operation.

One case where this pyramiding of reserve factors may work to a disadvantage is in centrifugal compressors. Since the minimum capacity of a given blower is fixed by the pumping or snort point at approximately one-half of the maximum, it is just as important not to have the compressor too large as too small.

While the ideal situation would be that in which all equipment reached bottleneck conditions at the same capacity, this is obviously impossible except for one fixed set of operating conditions. Consequently, compromises are in order if one would endeavor to have the maximum flexibility in those pieces of equipment least easily modified or replaced.

Meter Instrument Fluid Traps

CARRYOVER water from gas lines may be prevented from accumulating in meter mercury pots on instruments run by installation of automatic fluid traps. On a gas orifice-meter run, two drip pots were installed on the two lines carrying gas from the orifice to the meter. Two automatic traps used in conjunction with the pots were also installed. On the particular installation these traps were offset horizontally so fluid from the traps would not drip on meter run below.



A valve and union are included in the piping running from the drip pot to the trap. The valve permits the traps to be conveniently removed from the system for repair while the union permits periodic blowdown of the traps without disassembling hookup.

By means of this simple installation, the accumulation of fluids in meter pots, with the associated faulty readings and need for draining the pots, is eliminated.

Method suggested by Madison E. Spell and Horace G. Williams, meterman, Tomball, Tex.; courtesy Humble Oil & Refining Co.

With the know - how gained from 12 years of experience, here's . . .

How Sinclair Prepares Pipeline for Product Service

by L. B. Moon

1. **Before welding . . .** each joint of pipe is swabbed with a leather or canvas belt disk to remove heavy rust and scale.
2. **After welding . . .** of each 5 to 15-mile length, an air-pressure test up to 100 psi. is made to catch major leaks before tie-in welding.
3. **When the line is completed . . .** a complete hydrostatic water test is run to catch all minute leaks in the finished line.
4. **Pre-service cleaning . . .** a series of scraper passes using water, then heavy oil, and finally gasoline cleans the line for service.
5. **Periodic in-service cleaning . . .** is done to keep the line in good condition and eliminate product contamination.

VARIOUS methods of cleaning pipelines for initial operation in products service have been used by Sinclair Pipe Line Co. during the past 12 years in placing more than 2,900 miles of line in such service. Experience has shown that a hydrostatic pressure test and a cleaning program of water followed with heating oil, including heavy use of scrapers in both phases, produces satisfactory results.

During the initial period of line operation only products which will not be seriously affected by increase in gum content or change in color specification should be pumped. Kerosine, particularly susceptible to degradation due to color change, should not be handled until the line has been well cleaned with heating oils and gasolines.

Heating oil used in cleaning any line converted from crude service must usually be returned to a refinery for reprocessing.

Construction phase . . . During the construction of products lines, company specifications require that each joint of pipe be swabbed with a leather or canvas belt disk before the joint is placed in alignment for welding. After a section of pipe 5 to 15 miles in length has been welded together, it is tested with air pressure up to 100 psi. before the tie-in weld is made.

Paper was presented to the fifth annual spring products pipeline conference under the auspices of the A.P.I. Division of Transportation, Warwick Hotel, Philadelphia, May 10, 1954.

In addition to the longer sections, all highway and railroad crossings which require casing and all river crossings are tested before they are put into place. During these air tests a sizing pig is often pushed through the line. This operation removes most of the debris which remains in the line after it has been swabbed.

When the line has been completed, this company would prefer to have a complete hydrostatic water test. If the line is in a very cold climate, where there is danger of freezing of the water in the line, the water testing will be omitted. In these cases the line will be tested with heating oils.

In making the water test, the line is divided into sections with block valves. These sections vary in length from 10 to 80 miles. Procedure in testing the line is as follows:

1. Even when large rivers or lakes are used as the source of water it is preferable to pump the water into a tank to permit dirt and foreign matter to settle out before pumping into the pipeline. When this is not possible great care must be taken to prevent dirt, mud, or gravel from entering the pump suction.

2. Water to fill the line is pumped into the longest section to be tested with high-volume, low-head centrifugal pumps. A scraper should be run at the front end of the water to purge air from the line.

3. Pressure on the first section is gradually raised to the desired test pressure by means of a high-pressure, low-volume pump. Care must be taken to avoid undue pressure at low points in the line, especially if the line is laid through mountainous regions where there may be considerable difference in elevation between the input point and the lowest point. Also, if the line is laid with pipe varying in wall thickness, lower pressures must necessarily be used on the thinner wall pipe—all

Fig. 1—Sample of impurities removed on initial cleaning.

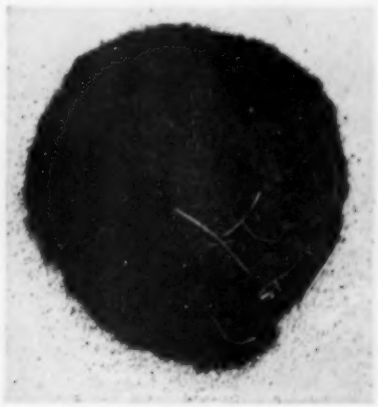


Fig. 2—Sample of impurities removed after pumping 1,000,000 bbl.

Fig. 3—Sample of impurities removed after pumping 2,000,000 bbl.

Fig. 4—Condition of 8-in. knife and brush scrapers after 150 miles of pipeline travel.

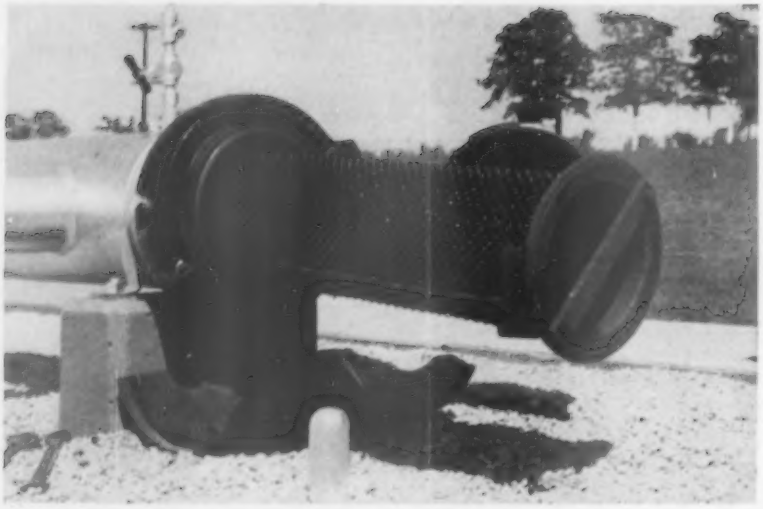


Fig. 5—This combination strainer and scraper trap has eliminated need of a large number of valves previously required and has improved appearance.

other factors being equal. Some lines which are laid from a combination of new and second-hand pipe must also be handled with varying test pressures.

4. The line will remain under the desired test pressure from 6 to 12 hours.

5. When the test has been successfully completed, the water will then be displaced into the next section with heating oil, and the same procedure repeated. This will continue until all remaining sections of the line have been tested.

This procedure is based on the premise that new pipe or clean second-hand pipe was used in the construction. If the line is built of second-hand pipe which has been in crude service, additional cleaning operations will be necessary.

Crude-to-products conversion . . . If the products line is to be built of second-hand pipe which is being used in crude-oil service, it is advisable to remove a large part of the residual waxy deposits before the line is taken from crude service. To do this the following steps should be taken:

1. A series of scrapers should be run in the crude stream before the line is taken out of service.

2. Running a high-gravity sour crude oil through the line will aid in removing the solidified water and sediment. It is important to get as much as possible of the solidified deposits out of the line because the water used in displacing the oil will set and harden the waxy components, making later cleaning more difficult.

3. When the line has been cleaned as much as practical by the previously described methods, preparation must then be made for displacing the oil. A suitable source of water is again necessary, as well as a high-capacity portable pump. It is advisable to insert several scrapers into the front part of the water in order to insure as complete a displacement of the oil as possible.

Before the pipe can be taken up, disposition of contaminated line fill of water must be made, and this presents serious problems. The line must be cut at the low points, where the water can run off without damage to cultivated or pasture land and without contamination of streams or water reservoirs. The use of compressed air to force out the water is extremely dangerous because of the explosive vapor-air mixtures formed by the oil which remains in the line. The line must also be tapped at high points for the purpose of allowing air to enter the line in order to obtain better drainage of water.

THE AUTHOR

L. B. Moon, vice president and director of the products pipelines of Sinclair Pipe Line Co., joined Sinclair in 1927. He was associated with plant operation and construction work until 1941 when he became superintendent of construction and operation of the products pipe line department of Sinclair Refining Co. He was named general manager of that department in 1950 and in 1951 was appointed to the position he now holds when the present Sinclair Pipe Line Co. was organized.

Displacement of water . . . It is preferable to displace the water used in testing any line, either new or second-hand, with heating oils rather than with lighter products. It has been the experience of this company that the scraper used in the displacement will move easier and will be subject to less wear on the rubbers. It has been learned that the mill scale and water will be carried in suspension in larger quantities because of the heavier weight of the oil.

When pipe formerly used in crude-oil service is placed in products operation, a light distillate is usually used to displace the water, because this distillate acts as an excellent solvent for the deposits of foreign matter which remain in the line. This distillate, because of its contamination, is usually rerun in the nearest refinery.

Only products which will not be seriously damaged by an increase in gum content or off-color specifications should be handled during the initial period of operation. Straining, filtering, and analyses of products handled showed that not only the residue of hydrocarbons, but also a very fine iron oxide and mill scale were left on the inside wall of the pipe, and these residue products were responsible for the color damage. Figs. 1, 2, and 3, show samples of the impurities removed from a line during initial operation, after 1,000,000 bbl. had been pumped through the line, and also after 2,000,000 bbl. had been pumped. It has been found that, after the rust, mill scale, and film of wax had been removed, this company's oil-soluble corrosion inhibitor, RD-119, materially reduced further internal corrosion of the line,

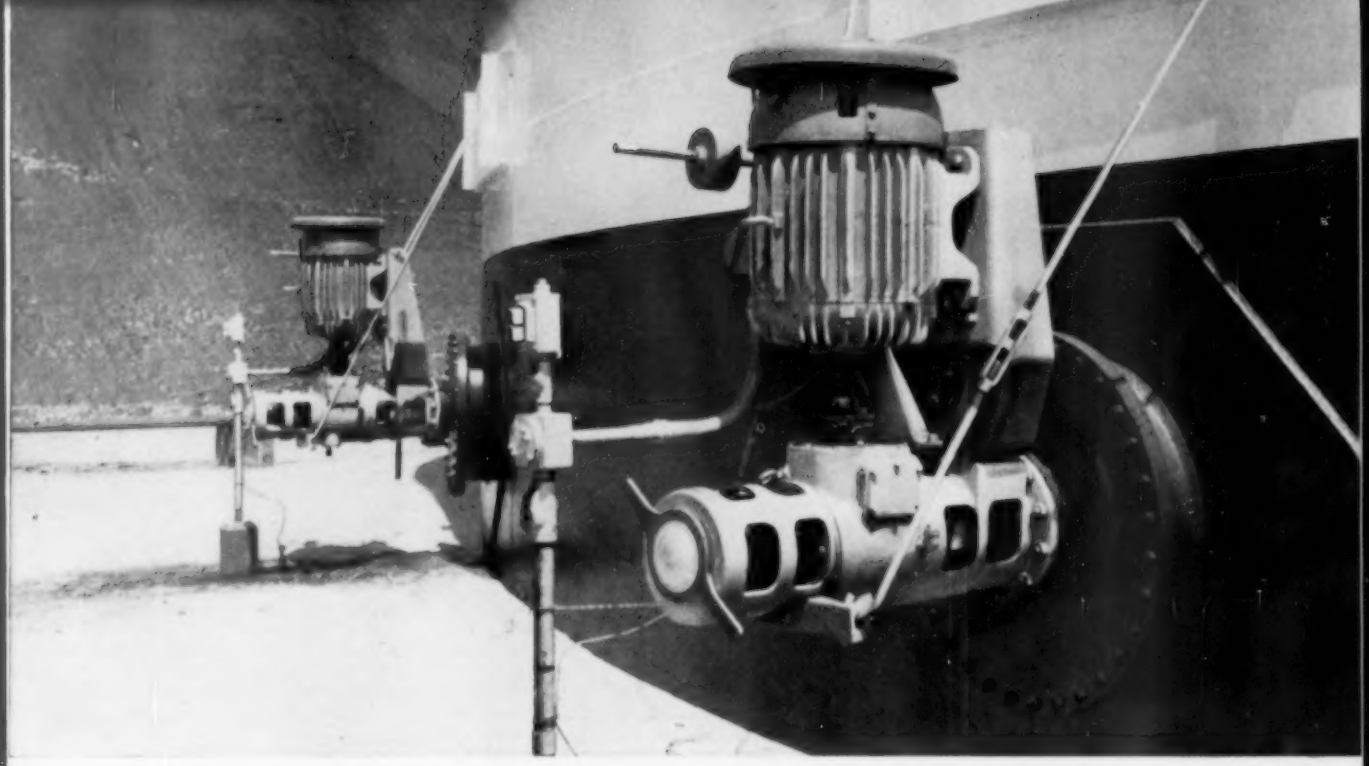


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Fig. 6—End view of a scraper trap shows the amount of foreign matter removed from 150 miles of 8-in. line.

Fig. 7—Side view of a combination strainer and scraper trap now in operation. Note the quick-opening flange cover.

as shown in Fig. 6. The iron oxide and mill scale shown in Fig. 6 represent the total amount brought in by this scraper from 150 miles of 8-in. line.

To give an example of this company's experience in the conversion of 460 miles of 8-in. crude-oil line to products service, the first 13,200 bbl. of heating oil was pumped into the crude stream and returned to the refinery. Approximately 255,000 bbl. of heating oil had been pumped through the line, with several series of scrapers, before gasoline was pumped through the line, and almost 3,000,000 bbl. of heating oil and gasoline had been pumped through the line before water-white kerosine could be handled without the loss of several numbers in Saybolt color.

The company's most recent project of laying, testing, cleaning, and putting into products pipeline operation was 82 miles of 12-in. relaid crude-oil pipeline. The line was filled with water and put under testing procedure until all weak sections were located, removed, and replaced. As soon as desired line pressure had been maintained, heating oil was started into the line, with No. 1 scraper (a severe plow-type) approximately 1,100 bbl. from the front end of the oil; No. 2 scraper (same type as No. 1), 3,100 bbl.; No. 3 scraper (expanding-brush-type), 4,200 bbl.; No. 4 scraper (severe cleaning plow-type), 7,000 bbl.; and No. 5 scraper (expanding-brush-type), 12,000 bbl.

The initial pumpings of products, following completion of the water test, were 15,000 bbl. of No. 2 fuel oil—followed by 15,000 bbl. of kerosine, which was followed by gasoline. All of the fuel oil and 2,500 bbl. of the kerosine were delivered to a refinery in a crude-oil stream, and the remaining 12,500 bbl. of kerosine was delivered directly into another pipe line for cleaning purposes. When this kerosine was cut to the other line, the Saybolt color was plus 19, thus indicating a loss of 8 numbers because of its travel through the 82 miles of relaid 12-in. line.

A total of 1,212,000 bbl. of products had been pumped before it was felt safe to deliver kerosine which would meet color specifications. This movement arrived at destination with a plus-26 color, which was a loss of 4 numbers.

Scraper operation . . . Scrapers serve a very important part in the initial displacement and cleaning. The following precautions normally are observed in scraper runs:

1. In a line relaid, or in one converted from crude-oil service, the first scraper will be put into the line 1 to 2 hours behind the front end of the oil. In a new line the scraper will be placed in the front end of the oil. This scraper generally will be a severe cleaning-type scraper, such as a knife or plow type. Following this first scraper will be a plug or brush-type scraper which will be put into the line 1 to 2 hours behind the initial scraper. A third type of scraper sometimes used is an expanding-brush scraper. In some cases where an excessive amount of paraffin is present—as was the case in the 12-in. relaid crude-oil line mentioned previously—additional knife and plow scrapers should be run during the initial cleaning.

2. Scrapers will continue to be started in sets of two, with an interval of 4 to 6 hours between sets in a relaid or converted line, and at intervals of 8 to 12 hours in a new line. Fig. 4 shows both a knife and a brush-type scraper after 150 miles of travel through an 8-in. line.

3. The rate of flow in the line will be maintained at not less than 50 per cent of the maximum rate at which the line will operate; the higher the rate of flow, the better the cleaning job performed.

While the scrapers and initial products are being run through the line, it is found very advantageous to set hay tanks temporarily at pump stations and delivery points on the line. The period of time these hay tanks remain in service naturally depends upon how rapidly the mill scale and iron oxide are removed from the line, but an average period of time is usually between 6 months and a year. When to put meters and fine strainers into operation must necessarily depend on the time required to get the stream clean enough. Even after several months of operation, the front end of a batch of oil will contain some rust and mill scale.

After the line has been in operation on inhibited products for a sufficient time to be well cleaned, it is found that the use of a horizontal combination strainer and scraper trap will provide very satisfactory operation. A quick-opening flange cover permits ready access to and removal of the strainer, as shown in Fig. 5. This combination strainer and scraper trap has also been responsible for the elimination of a large number of valves previously required, and has greatly improved the appearance of the piping layout. Fig. 7 shows a side view of a combination strainer and scraper trap, with quick-opening flange cover, now in operation.

What you should know about

DRILLING-MUD ADDITIVES

. . . The what, when, and how much of these useful tools

by Robert J. Enright
District Editor

MODERN drilling-mud additives perform a most useful function in "building" proper drilling fluids out of a mixture of basic ingredients.

The selection and proper use of these modern mud additives can often be responsible for the manufacturing of a high-class mud which can meet specific performance requirements, from a mediocre or poor mud.

There are a considerable number and variety of mud additives. When should each be used? And why? How? In what amounts?

To assist tool pushers, drillers, roughnecks, and even engineering personnel, in the proper understanding and classification of modern mud additives, detailed tabulations have been compiled by the staff of the Petroleum Extension Service, University of Texas.

The additives classification was worked up initially in 1948 by James Conway, now assistant general superintendent of Carl B. King Drilling Co., and was edited and revised in 1953 by Philip C. Blackburn, now director of engineering and field activities for the American Association of Oilwell Drilling Contractors. It has been used since its development as a training aid in a school conducted in the field for driller, roughnecks, engineers, and others interested. The course, conducted by the Petroleum Extension Service, University of Texas ("Petex"), and sponsored by A.A.O.D.C., Dallas, is called "Principles of Drilling-Mud Control."

The classification eliminates much of the confusion concerning additives by grouping the same basic materials under one heading, together with trade names and manufacturers. Composition and uses for each additives group also are set out.

The list is the result of a lot of hard work. A complete list of products was obtained from all major mud suppliers in the Mid-Continent, Gulf Coast, Southwest, and Rocky Mountain areas, and from a majority of West Coast suppliers. The classification then was made from the products list. Those additives for which patents are held by other than mud-supply companies and distributed through agents to local distributors were listed under the names of the local distributors.

Mud school . . . Both the school and the manual used for instruction came into being in 1947. The manual was compiled from mimeographed sheets worked up by John Woodruff, director of the Petroleum Extension Service at Texas University. Subsequent editions have been revised and edited by regional committees on drilling fluids of the American Petroleum Institute. These committees for the most part are composed of representatives of drilling-contracting, mud-supply, and operating companies. The text is the only one devoted exclusively to drilling fluids.

The school started out as a 25-hour course. Due to advances in mud technology it was expanded to 30 hours, 3 hours a day for 2 weeks, in 1952. It is conducted in the field wherever there is a demand for it.

Classes, which have ranged up to 50 members, usually are held to 20 or 30 men if possible. One class is held in the morning so that drilling-crew men working the evening tour can attend, another in the evening for those on the day and morning shifts. Requests that the school be conducted in a certain town usually come from drilling contractors or oil companies in the area. The classes are repeated in an area about every 4 years due to turnover in personnel in the area and advancing mud techniques and products.

In addition to receiving a working knowledge of mud additives, drillers, roughnecks, and others are taught how to test mud—how to analyze its physical properties and some of its chemi-

A.A.O.D.C. Teaches Drilling-Mud Control

STUDENTS enrolled in school on "Principles of Drilling Mud Control" at Great Bend, Kans., learn how to use standard filter-loss and wall-cake tester (tall instrument), and Stormer viscosimeter (to right of filter-loss tester). Jars of chemicals and balance for chemicals used in mud conditioning are at lower right. From 18 to 20 of these nonprofit schools, conducted for drillers, roughnecks, and engineers by the Petroleum Extension Service of the University of Texas, and sponsored by the American Association of Oilwell Drilling Contractors, normally are held each year all over the United States and in Canada.

A Brief Outline of Common Drilling-Mud

FRESH WATER CLAYS
BENTONITE (Sodium Bentonite)

The highest-grade colloidal clay, sp. gr. 2.5, added to drilling fluids to increase viscosity, give thixotropic gels, and to decrease water loss. Usually used with a dispersion agent or thinner, such as caustic-quebracho, when water-loss reduction is required.

Trade name and company—
Aquagel, Baroid Sales Division.
Magoogel, Magnet Cove Barium Corp.
Mil Gel, Milwhite Mud Sales Co.
Control Gel, Mud Control Laboratories.
Indian Gel, Indian Mud Co.
Superior Gel, Acme Lumber Co.

PREMIUM DRILLING CLAYS

Bentonite clay contaminated with nonyielding clays and calcium. Milled or ground with soda ash to increase yield. Added to salt and fresh water muds to increase mud solids.

Trade name and company—
Baroco, Baroid Sales Division.
High Yield, Magnet Cove Barium Corp.
Green Band Clay, Milwhite Mud Sales Co.

COMMON DRILLING CLAYS

Ground shales or clays containing some bentonite that will stay in suspension but have low viscosity and high water-loss characteristics. Are often used in fresh-water muds with bentonite and salt-water muds with salt clays to increase mud solids.

Trade name and company—
Work Over, Milwhite Corp.
Exmix, Acme Lumber Co., and Permian Mud Co. (Okla. and Tex.).
Lubri-Sal, Acme Lumber Co. and Dufek Mud Co. (Kans.).
Indian Clay, Indian Mud Co.

SALT-WATER CLAYS
ATTAPULGITE CLAYS

Clays added to salt muds or salt-contaminated muds to increase viscosity—have very poor water-loss-reducing properties—starch is added to these muds when control of water loss is necessary.

Trade name and company—
Zeogel, Baroid Sales Division.
Salt Gel, Magnet Cove Barium Corp.
Salt Water Clay, Milwhite Mud Sales Co.
Well Gel, Acme Lumber Co.
Brinegel, Mud Control Laboratories.
Hi-Vis Gel, Indian Drilling Mud Co.

Note: To obtain maximum viscosity with attapulgite clay, the clay should have a moisture content of not less than 10 per cent. If the clay contains less than 10 per cent moisture, the clay either yields slowly or not at all.

THINNERS OR DISPERSING AGENTS
QUEBRACHO

pH 5.0. Sold by all mud distributors. Dried water extract of the quebracho tree of Argentina. (Wood, bark, roots or leaves). Most common thinner used. Usually dissolved with caustic soda. Minimum of 5 lb. caustic soda to 50 lb. quebracho.

HUMIC AND LIGNITE COMPOUNDS
(Powdered Brown Coal Type)

Trade name and company—
Carbonox, Baroid Sales Division.
Tan-A-Thin, Magnet Cove Barium Corp.
Liggo, Milwhite Mud Sales Co.
Tannel, Indian Drilling Mud Co.

Lower-priced material than quebracho. Does not have quite as much of a water-loss-reducing property as quebracho but requires less caustic soda than quebracho, is very effective on long-term treating programs and as an emulsifying agent for oil-emulsion muds.

CALCIUM LIGNO-SULFONATE

Trade name and company—
Lignox, Baroid Sales Division.
Kembreak, Milwhite Mud Sales Co. and other distributors.

This chemical is a dispersing agent and emulsion stabilizer which is most effective in the presence of high lime concentrations or when converting to lime-base mud. Slow acting in low lime concentrations or fresh-water muds. Soluble in water but with tendency to lump and become insoluble in caustic solutions.

COMMERCIAL OR TRADE-NAME ORGANIC THINNERS

Tannex—Baroid Sales Division—A mixture of approximately 25 per cent Carbonox and 75 per cent quebracho, milled together to eliminate packing and lumping in storage. Less waste than with straight quebracho which has tendency to lump and settle in chemical barrel.

Tanco—Milwhite Mud Sales Co.—Classified as "A blend of solublized lignite and quebracho." Probably about the same as Tannex.

Q-X—Magnet Cove Barium Corp.—Listed as quebracho compound.

Alkatan—Magnet Cove Barium Corp.—Caustic soda and quebracho ground together in ratios of 1:1 or 1:2.

Hydrotan—Baroid Sales Division—Dry caustic soda and tannate compound, (quebracho and/or chestnut extract), ground or milled together in ratios of 1 part caustic soda and 1 part tannate compound or 1 part caustic soda and 2 parts tannate compound.

Red Mud—Baroid Sales Division—Concentrated solution of caustic soda and quebracho. Liquid—55-gal. drums.

Tannex Red Mud Conditioner—Baroid Sales Division—Caustic soda and tannin solution. Liquid—55-gal. drums. Made with Tannex instead of quebracho.

Cau-Tan—Acme Lumber Co.—Same as Red Mud.

Hydrocarb—Baroid Sales Division—Caustic soda and Carbonox milled together dry in ratios of 1:1 and 1:2.

PHOSPHATE THINNERS

Usually a complex or a combination of complex phosphates used primarily as thinners. Very effective where drilling is fast and considerable makeup is required and pits are cleaned frequently. The complex phosphates tend to revert to simple phosphates (not thinners) in 24 to 36 hours hence or faster at an elevated temperature and are not used normally when drilling deep hot holes or when the drilling is extremely slow.

Phosphates should not be used in high-temperature mud or lime muds. Should **not** be used without pilot testing first.

Sodium Hexameta Phosphate
($NaPO_3$) 6 pH 6.0
Calgon
Buromin
Hagon

Sodium Tetra Phosphate
($Na_6P_4O_{13}$)—pH 7.5
Quadro Phos
Oil Fos—Monsanto
Polyfos—Blockson
Barafos—Baroid Sales Division
Magcophos—Magnet Cove Barium Corp.
Remyphos—Milwhite

Tetra Sodium Pyrophosphate
$Na_4P_2O_7$—pH 9.9
Sodium pyrophosphate
T.S.P.P.
Valvosa 99
Hornkem 99
Dispersoid
Vis Gon Base

Sodium Acid Pyrophosphate
$Na_2H_2P_2O_7$—pH 4.8
S.A.P.P.
Valosa 48
Hornkem 48

Disodium Phosphate
Na_2HPO_4—pH 8.6
Valosa phosphate 86
Hornkem 86

WATER-LOSS-CONTROL ADDITIVES

Driscose—Sodium carboxymethyl cellulose—sold by all distributors—used to reduce water loss in neutral or alkaline mud. SHOULD NOT BE USED IN SALT.

Muds—Also used as an emulsion agent in oil-emulsion muds.

Areopan—American Cyanamid Corp.—An organic resin, dispersible. Pretty much in the development stage at present but shows great promise in high-temperature muds, does not need preservative. Requires considerable care in mixing to get maximum results.

Trade name and company—
My-Lo-Gel, Magnet Cove Barium Corp.
Impermex, Baroid Sales Division.
Milstarch, Milwhite Mud Sales Co.
Superior Starch, Acme Lumber Co.
Indian Star Jel, Indian Mud Co.
Controloid, Mud Control Laboratories, Inc.

Note: As a rule, should be used with some type of preservative in low-pH fresh-water muds. May be used 3 or 4 days without preservative.

Additives and Discussions of Some of Their Uses

STARCH PRESERVATIVES

High Alkaline Mud (pH 12.+).

Saturated Salt Brine—26 per cent (310,000 p.p.m.)

Preservative No. 5—Baroid Sales—A mixture of paraformaldehyde and Dowcide G.

My-Lo-Gel Preservative—Magnet Cove Barium Corp. — (Probably paraformaldehyde or mixture of paraformaldehyde).

Paraformaldehyde—(HCOH)—Sold by all distributors except Baroid. Excellent preservative.

Dowcide "G" — Pentachlorphenol. Sold by most distributors—slow acting—fair preservative.

Liquid Formaldehyde Preservative — Crude formaldehyde manufactured by Cities Service Corp. Sp. gr. 1.12 (approx.) about 25 per cent formaldehyde. 1 lb. approximately equivalent to 0.4 psi. No. 5 or 0.2 lb. paraformaldehyde.

Cresote—Poor preservative, hazardous.

WEIGHTING MATERIALS

All of the mud companies sell barytes as material to increase the weight of drilling fluids. Sp. gr. 4.2—4.3 should be ground to pass 95 per cent plus through 325 mesh screen on wet test.

Trade name and company—
Baroid, Baroid Sales Division.
Magcobar, Magnet Cove Barium Corp.
Barytes, Acme Lumber Co.
Milbar, Milwhite Mud Sales Co.
Mo-Bar, Missouri Barytes Co.
Arizona Barytes, Arizona Barytes Co.
Indian Barite, Indian Drilling Mud Co.

LOST-CIRCULATION MATERIALS

The type of lost circulation used depends on the type of lost-circulation zone encountered, therefore, one kind is not recommended over another.

Mica—Sold as Micatex by Baroid Sales and simply as mica by most mud distributors—prepared in fine-mesh and coarse grades. As a rule, not necessary to remove shaker or screen with fine mesh.

Leather (finely shredded)
Leatherfloc—Baroid Sales Division.
Leatherfloc—Magnet Cove Barium.
Leather-O—Milwhite Sales Co.
Note: Not effective in salt-water muds.

Nut Hulls—(Ground)
Tuf-Plug—Sold by all distributors.
Tem-Plug—Acme Lumber Co.

Textile Fibers
Kingseal—All distributors.

Shredded Tree Bark and Wood Fiber
Balsam Wool—All distributors.
Palco Seal—All distributors.
Crevice Seal—Indian Mud Co.
Magcofiber—Magnet Cove Barium Corp.
Control Fiber—Mud Control Laboratory.
Superbridge—Mud Control Laboratory and Acme Lumber Co.
Fiber-Seal—Magnet Cove Barium Co.
Silvacel—Acme Lumber Co.
Queenseal—All distributors.

Sugar Cane Bagasse (Sugar Cane Pulp)
Fibertex (processed bagasse and wood fiber)—Baroid Sales Division.
Silva Flake—wood flakes—Mud Control Laboratories, Acme Lumber Co., and Magnet Cove Barium.
Mud Fiber (bagasse and wood fiber)—Magnet Cove Barium Corp.
Milfiber (bagasse and wood fiber)—Milwhite Mud Sales Co.
Strata-Fiber (bagasse and wood fiber)—Acme Lumber Co.

Polymerized Plastic Materials
Jelflake—flaked plastic—all distributors.
Chopped, shredded cellophane—All distributors.

Perlite—A Light Heat Expanded Mineral
Pana-Seal—Perlite—Baroid Sales Division.
Controlite—Perlite—Mud Control Laboratories, Inc.
Intraseal—Perlite and crushed bentonite—Baroid Sales Division.
Strata Seal—Perlite and bentonite—Mud Control Laboratories, Inc.

Cement and Bentonite
Formaplug—High gel-forming clay and cement mixture for fractured formations—Magnet Barium Corp.
Aquagel-Cement—Bentonite (Baroid Sales Division) and cement.
Cotton-seed hulls—All distributors — will spoil or ferment if used too long without preservative (paraformaldehyde).
Cal-Seal and Super Cal-Seal—Special fast-setting forms of plaster of paris with high angle of repose on slump test. Sets to maximum hardness in 30 minutes. Setting inhibitor should be used to increase setting time and to avoid flash setting. Made by U. S. Gypsum Co. and usually distributed by cementing companies.

Cement Contamination Treating Compounds
Sodium bicarbonate—$NaHCO_3$ pH 8.5.
Sodium acid pyrophosphate (S.A.P.P.) $Na_2H_2P_2O_7$ pH 4.8 (Must be used with care, otherwise, an acid, unstable mud will be obtained.)
Sementox—Baroid Sales—A mixture of sodium bicarbonate, bentonite, and chestnut extract. Supposed to eliminate possibility of overtreating with sodium bicarbonate.

Defoaming Agents
Castor oil—commercial grade—used with distillate.
Octyl alcohol—very good for removing surface foam.
Pine oil—used straight or with distillate.
Antifoam A—A Dow-Corning silicone.
Defoamer—E-150 Magnet Cove Barium product—excellent for removing entrained gas or air.
Foambreaker—Permian Mud Co.—liquid.
Santomerse—Monsanto Chemical Co. and Baroid Sales Division—Surface-tention-reducing soap.
Defoamer—Acme Lumber Co.

OIL EMULSION MUD—OIL EMULSIFIERS

Caustic-Carbonox—Baroid Sales Division. 13 lb. carbon per bbl. of mud and 1 lb. per bbl. of caustic.
Hydrocarb — Baroid Sales Division—1:2 ratio of caustic and lignite.
Emulsite—Magnet Cove Barium Corp.—1:4 ratio of caustic and lignite.
Seeco-Mul—Acme Lumber Co. and Indian Mud Co.—Powder use 1 to 3 lb. per bbl. of mud.
Silvacon—Acme Lumber Co. — Use not stated.
Jel Oil S. Concentrate—Magnet Cove Barium Corp.—1 to 2 lb. to bbl. of mud.
Jel Oil E. Concentrate—Magnet Cove Bar-Corp.—a ready-mixed oil and emulsifier.
White Magic—Oil Base Mud, Inc.—1 to 2 lb. per bbl. of mud.
Superior Emulsifier—Superior Mud Co.—1 to 2 lb. per bbl. of mud.
Tall Oil—Indian Mud Co.—liquid—use about 1 qt. tall oil and ¼ lb. caustic per bbl. of mud.

Note: With the exception of the lignites (Carbonox, Hydrocars, Tanathin, Emulsite), all emulsifiers are a soap of one type or another.

OIL-BASE MUDS

Black Magic—Oil Base Muds, Inc.
Light Black Magic — Asphalt on ground oyster shell—ground limestone.
Heavy Black Magic—Asphalt on barytes—used to increase weight of oil-base muds.
Heavy and Light Black Magic—shipped in powder in sacks. Mixed with oil or distillate at location.
Jell Oil Mud—Magnet Cove Barium Corp.—Mixture of asphalt, tall oil—caustic oyster shell and oil. Premixed at central plant and shipped to location in tank trucks.

MISCELLANEOUS MUD CHEMICALS—All Distributors

Water Glass — sodium tetrasilicate—$Na_2Si_4O_9$ — Both used in muds to control heaving shales.
Sodium Metasilicate—Na_2SiO_3.
Caustic Soda—Lye or sodium hydroxide—NaOH—used with organic thinners and for pH control.
Soda Ash—Sodium carbonate—$NaCO_3$—Used to remove gypsum or anhydrite contamination.
Anhydrox—Baroid Sales Division—Barium Carbonate—$BaCO_3$—used to remove gypsum or anhydrite contamination. (pH should not be above 9.5.)
Plaster of paris (plaster)—Calcium sulfate, $CaSO_4$—¼ H_2O—used in plaster-base mud.
Aeroflow-Dicyandiamide — Used for the preservation of phosphate thinners at high temperatures.
Sodium Dichromate—$Na_2Cr_2O_7$—Used to reduce corrosion of drill pipe.
Sodium Nitrite—$NaNO_2$—Used to reduce corrosion of drill pipe.

DRILLING-MUD SCHOOL at Artesia, Colo., teaches enrollees use of standard filter-loss and wall-cake tester (center), Stormer viscosimeter (left), and Marsh funnel viscosimeter (right).

cal properties. They learn how to control viscosity, weight, and water loss by changing the chemical properties of the mud.

To date more than 6,500 have taken the course, which has been held in 19 oil and gas-producing states in the United States and in Alberta and Saskatchewan in Canada.

The school is conducted on a nonprofit basis. Charge per enrollee is $10 in Texas. Due to the fact that in other states the boards for vocational education do not provide in their budgets for oil-training courses, the additional cost of instruction is underwritten by A.A.O.D.C. and a higher fee of around $15 per enrollee must be charged to break even.

The school is presented about 18 to 20 times a year on the average. The highest number ever conducted was 22. This year, it is contemplated that fewer courses than normal will be taught due to a shortage of help.

Training equipment is transported from place to place at a cost ranging from about $1,500 to $2,000 per year. It comprises six complete sets of standard mud-testing equipment, including mixers, filter-loss testers, viscosity funnels, viscosimeters, mud balances, etc. Small quantities of a large variety of mud additives also are included. The six units of equipment permit breaking down the classes in small groups of five or six men for more efficient instruction.

Cambrian Has the Stage in West Texas

(Continued from page 119)

quence are potential source and reservoir rocks. Hence a Cambrian structure is a potential oil field with or without thick, and/or water-bearing Ellenburger above it.

Management, however, is often reluctant to drill expensive wildcats on prospects or ideas that do not conform to accepted rules or that are contrary to current trends of geological thinking.

Outlook

Recent dry holes have shown that most of the present producing areas will cover less than a square mile. However, the indicated reserves and thick pay sections at 6,000-7,000 ft. make the Cambrian an attractive primary objective for wildcat drilling. Most farmout deals in the area now require testing the Cambrian, and as a consequence, more new fields will be discovered in the near future.

Operators agree that production along the present trend will eventually extend north into Fisher and possibly Stonewall counties and south into Tom Green and Schleicher counties.

Some companies are looking at the Cambrian from a regional point of view, but they are a minority. They believe that production may be expected over a broad area long the old Cambrian shelf.

A rank wildcat that establishes Cambrian sand production after drilling a thick, and/or water-bearing Ellenburger section will break the play wide open. Until then, convenient rules of thumb will probably outweigh optimistic thinking on the part of exploration geologists.

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Cambrian Field Trip—Llano Area

The San Angelo Geological Society's first annual field conference guidebook served as the principal reference for this article. Under the leadership of Drs. Barnes and Bell of the University of Texas, an integrated picture of the exposed Cambrian rocks on the northwestern flank of the Llano Uplift was presented. This new material will interest not only the stratigraphers but all geologists. Continuing northwestward, the outcrop sections have been tentatively tied by well control, shown clearly by cross-sections into the area of the new oil fields of Coke and Nolan counties, Texas. The surface and subsurface work will be a useful aid in the preparation of Cambrian facies maps necessary for the localization of the best porosity trends whether in sand or dolomite.

Multidata structural maps, accompanied by lucid cross-sections, reveal the character and conditions necessary for Cambrian production. Other pertinent articles describe the paleogeographic location of the Texas Arch and Peninsula, a sink in Hickory sandstone (basal Cambrian) filled with Pennsylvanian rocks, and a summary of the character of the Eastern Platform basement. It will surprise many that basement may be Packsaddle marble and in well cuttings not readily distinguishable from the carbonates of the Cambro-Ordovician. Since Cambrian production to date has been associated with basement highs, both geologists and geophysicists will be interested in the gravimetric and magnetic measurements made on Llano Uplift rocks. A paleontological article presents a statistical study of Irvingella and a map shows sample localities. A penetration map, showing all wells reaching Cambrian rocks and/or basement, from the Llano Uplift out onto the Eastern Platform will serve many purposes and hydrologists may well become interested in the many potential Cambrian aquifers. Last but not least are two historical articles—one covering the man-made history of the field conference area and the other a history and habitat of Cambrian production in the United States.

This guidebook, price $7.50, may be ordered from San Angelo Geological Society, Box 632, San Angelo, Tex.

Acknowledgment... Information on the White Flat field was supplied through the courtesy of American Trading & Production Corp. and Arthur W. Neff, Abilene, Tex.

Quick Check on Fractionating-Tower Diameters

by R. P. Wheeler

THE Brown-Souders entrainment equation used for sizing towers is:

$$W = C\,[d_2\,(d_1 - d_2)]^{1/2}$$

where

- W = vapor mass velocity, lb./hr./sq. ft.
- d_1 = density of liquid, lb./cu. ft. at tower temperature
- d_2 = density of vapor, lb./cu. ft. at tower conditions
- C = a constant relating plate spacing to liquid surface tension

In the following graphical representation of this equation, solving for tower diameter, the very small d_2 value was omitted from the $(d_1 - d_2)$ term and an average surface tension line was approximated over the range of plate spacing to facilitate a direct relationship between the plate spacing and tower size.

The chart is recommended for use only when sizing towers on vapors heavier than 58 molecular weight. In sizing towers handling lighter material (i.e.: depropanizer, deethanizer, etc.) the trend is going toward adding liquid downcomer area to determine the final tower diameter.

The use and accuracy of the chart is illustrated in the following examples:

Example 1

A topping tower operates at 20-psia. pressure and a top-tower temperature of 270° F. The amount of vapor at the top of the tower, which includes overhead product and internal reflux, is 40,000 lb. per hour. The vapor has a gravity of 60° A.P.I. with a characterization (K) factor of 12.0. The tower has a plate spacing of 24 in.

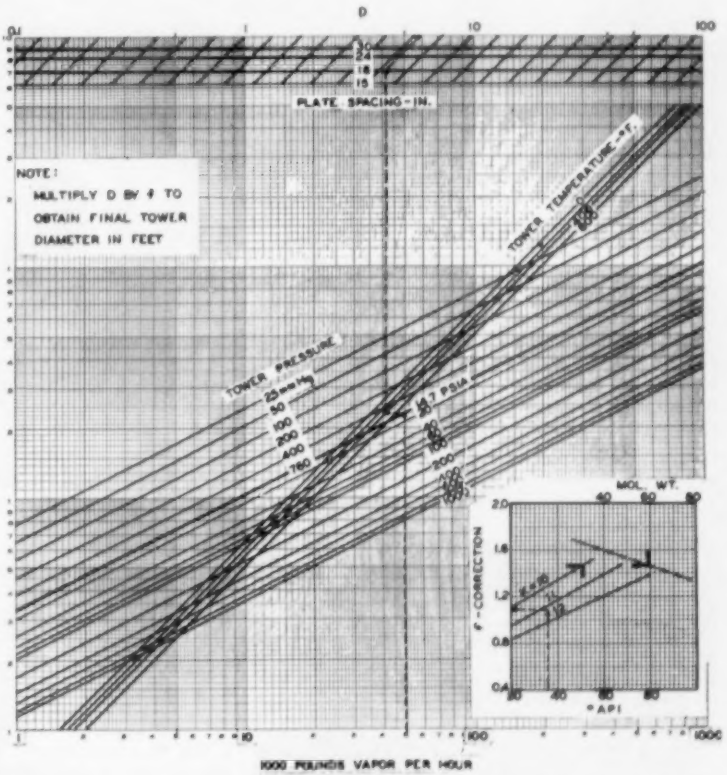
For a graphical solution, follow the 40,000-lb.-per-hour line vertically to the intersection with the 20-psia. line and follow this intersection point horizontally to a temperature of 270° F. on the series of temperature lines. From this intersection point go vertically to the 24-in. plate spacing line and proceed diagonally to a D value of 4.2. In the lower right-hand corner follow the 60° A.P.I. line vertically to the intersection with the K value line of 12 and read an f value of 1.2. The final tower diameter is the product of D and f or 5.04 ft.

The calculated value by use of the Brown-Souders equation is 4.95 ft.

Example 2

A vacuum tower operates at 100 mm. Hg pressure and a top-tower temperature of 300° F. The total amount of vapors in the top section is 100,000 lb. per hour of a 36° A.P.I. material with a characterization (K) factor of 11.5.

The diameter of the tower with 30-in. plate spacing from the chart is 11.10 ft., while the calculated value is 11.00 ft.



TOWER-SIZING CHART based on Brown-Souders entrainment equation. This chart is recommended for use only when sizing towers heavier than 58 mol. wt.

Author is with Continental Oil Co., at Ponca City, Okla. Chart was prepared in graduate work at University of Tulsa.

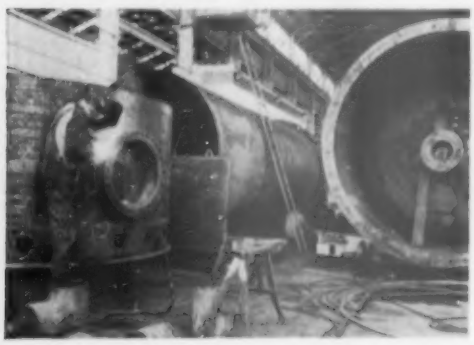
Mud...snow...cold can't slow "package" refinery job

"Bogged" but not "down"—
SWECO crews poured foundations, laid pipe lines, conduit, and built structures . . . fighting bad weather and mud all the way. To hold schedule, tons of rock were dumped in the mire to support construction equipment . . . excavations were pumped out day after day . . . straw blankets kept new concrete from freezing. Meanwhile, fabrication of process vessels went ahead in SWECO's own shops.

Despite severe winter weather, construction by SWECO of a "packaged" T.C.C. unit for Bay Refining Corporation, Bay City, Mich., has proceeded strictly on schedule. Fabrication of all heat-exchangers, fractionators and other vessels was completed in SWECO's own shops . . . while experienced SWECO field crews overcame mid-winter snow, mud and freezing weather to finish foundations and structural units on time. Close coordination of shop work with field work makes it possible to schedule completion in *10 months from signing of the contract to "on-stream" date.* The fine combination of pre-engineering, pre-fabrication, and field erection—perfected by SWECO for "package" refinery units . . . is typical of the imagination, ingenuity and reliability which have characterized this company's services to the process industries for more than 25 years.

For design, engineering and construction of complete "package" plants on a turn-key basis or custom fabrication of process equipment, it will pay you to consult SWECO.

Unique "derrick structure"
Use of this permanent oil-well derrick type structure for the catalytic section of "package" T.C.C. units was originated by SWECO. It eliminates the need for heavy rigging equipment and substantially reduces cost of both original construction and maintenance. Shown here is a finished T.C.C. unit, engineered and constructed by SWECO for Vickers Petroleum Company, Wichita, Kansas, a nominal 6,000 barrel "package" unit similar to the Bay Refinery job.



Shop-fabrication for field-erection
Heat-exchangers, fractionators, pressure vessels and other process units for the Bay Refinery job are fabricated, assembled and pressure-tested in SWECO's own shops . . . then shipped to meet the carefully coordinated field-erection schedule.

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Custom fabrication of all types of steel and special alloy vessels for the process industries.

Screen Separators.

Separation of Natural-Gas Liquids—1

by John M. Campbell

THE separation of hydrocarbon liquids by gravity is the most common and seemingly the simplest process used in production practice.

In reality, however, analysis of the conditions to obtain optimum separation becomes fairly complex because of the many factors involved. Such detailed analysis, although fairly uncommon in the past, has become of exceeding importance as the value of natural gas increases and awareness of conservation becomes a part of good producing practice.

With increased value of natural gas, all of the factors must be weighed. It is thus becoming increasingly common to base the means of separation on the gas requirements rather than on liquid alone.

Some variables . . . In general the following variables must be considered in the choice of the separation process:

1. Well-stream flowing temperature and pressure.
2. Pressure requirements of the residue gas.
3. Any specifications regarding heating value and/or liquid content of the residue gas.
4. Composition of the well stream to the separator.
5. Liquid products desired.
6. Method of handling liquids formed.

General Variables

The amount of separation obtained from any well stream at given conditions is estimated by the use of so-called "K" values which give the ratio of the mole fraction of any component in the liquid and vapor.

$$K = y/x$$

where:

K = equilibrium vaporization ratio
y = mole fraction of any component in vapor
x = mole fraction of any component in liquid

Without delving into the intricacies of phase relations, these "K" values may be calculated or obtained from actual data. Since they are a function of fluid properties as well as temperature and pressure, general correlations become exceedingly complex and time-consuming to use. Fortunately, at separation pressures below 1,000 psig., the effect of fluid properties becomes less pronounced and general correlations will normally fit the accuracy requirements of separation processes.

Several such correlations, tempered by actual data, have been used successfully by the writer. Methane is the most difficult of the components to correlate but this does not seriously affect recovery computations.

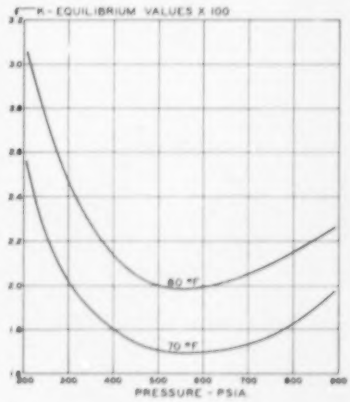
Pressure . . . The pressure of separation is normally governed by practical rather than process considerations. Economics normally dictate that the first stage of separation be at or above the pressure necessary for the residue gas. In cycling operations with high-pressure gas, for example, it is normally uneconomical to expand the gas to a pressure necessary for optimum liquid recovery and then compress it back to the necessary injection pressure. It is usually cheaper to compensate for the higher separation pressure by the use of a lower separation temperature, since the compression requirements for refrigeration are less than for gas.

The equilibrium "K" values plotted in Fig. 1 illustrate the variation of these values with pressure in the retrograde region. The optimum pressure would obviously be where these values are at a minimum, but unfortunately each of these minimum points occurs at a different pressure for each component. Therefore the optimum pressure for the mixture is a function of well-stream analysis and the products desired.

The retrograde pressure range for any component increases with molecular weight. Consequently the amount of separator liquid is proportional to pressure since the light ends predominate in the well stream. However, unless these ends are desired in the final product, increase in pressure does not always show advantage.

Temperature . . . At a given pressure the "K" values are proportional to temperature in the normal separation range. Consequently, as the temperature is lowered higher liquid recoveries are obtained, but the shrinkage of the sales gas becomes more marked. Therefore the optimum temperature is one which gives maximum recovery of the desired products with minimum gas shrinkage.

This optimum temperature is a function of well-stream analysis as well as pressure. The higher the percentage of the hexane-plus fraction the greater will be the recovery, at given conditions. The presence of large quantities of inert gases such as nitrogen also affects recovery markedly.



Variation of "K" values with pressure in retrograde region. Fig. 1.

Author is manager, process equipment department, oil and gas division, Black, Sivalls & Bryson, Inc., Oklahoma City. Paper presented at Ninth Annual Short Course on Gas Technology, Texas A. & I. College, Kingsville, Tex., June 2-4, 1954.

by W. L. Nelson
Technical Editor

COST-imating

Refinery Construction Costs Not Changing Significantly

THE cost indexes on this page may be used to bring the prices of the Cost-imating Series (October 21, 1948-December 29, 1949) to current prices. Similar itemized cost indexes are published each quarter in the first weekly issues of January, April, July, and October. In addition, the Nelson Refinery Construction Index appears in the first weekly issue each month on the Refining Page.

RECENT CHANGES IN NELSON REFINERY CONSTRUCTION-COST INDEX

	Jan. 1954	March 1954	April 1954	April 1953
Misc. equipment average	161.9	161.5	161.4	155.8
Iron and steel	178.3	176.4	177.1	172.5
Building materials	175.1	175.1	175.1	169.2
Materials component	174.4	172.0	173.6	168.5
Labor component	180.0	180.2	180.3	170.2
Refinery Construction Index	177.8	176.9	177.6	169.5

Itemized Cost Indexes

(Multiply the 1946 prices of the Cost-imating Series by these Index Numbers divided by 100.)

	1948	1950	1951	1952	1953	Mar. 1954	References*	Index for earlier years (The Oil and Gas Journal unless noted) in Cost-imating issues
Labor:								
Skilled construction	125.0	140.0	148.3	157.9	167.3	172.2	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	131.0	148.1	156.8	168.2	181.2	188.2	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	128.0	144.0	152.5	163.1	174.2	180.2		No. 61—Dec. 15, 1949
Refinery operation	126.0	137.6	149.1	155.1	165.2	167.6	Sur. of Current Business	No. 55—Nov. 3, 1949
Equipment or materials:*								
Boilers, tanks and sheet metal	†140.0	†136.0	†156.1	†153.4	†150.3	†148.5	Code 10-72	April 21, 1952§
Boiler tubes, 2-2¼ in.	†135.0	149.5	163.3	168.8	188.3	196.0	Code 10-14-61	
Building materials (nonmetallic)	147.1	154.8	164.3	164.4	171.1	175.1	Code‡ 13	No. 22—Mar. 17, 1949
Brick—building	122.8	132.5	141.2	140.6	142.8	143.8	Code 13-41	No. 20—Mar. 3, 1949
Brick—fireclay	133.3	153.4	165.3	167.1	181.8	190.0	Code 13-42	
Castings (foundry products)	144.6	152.9	167.2	168.0	176.8	181.3	Code 10-15	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	121.3	134.6	145.2	145.8	153.1	157.7	Code 13-4	No. 20—Mar. 3, 1949
Concrete—ingredients	119.4	125.3	132.7	132.7	137.8	140.6	Code 13-2	No. 22—Mar. 17, 1949
Concrete—products	118.9	124.4	132.8	132.6	135.9	138.4	Code 13-3	
Electrical machinery	127.6	134.9	154.3	152.4	156.4	160.7	Code‡ 11-7	See Marshall-S. (below)
Electrical motors and generators	128.6	135.0	155.8	154.6	157.1	159.0	Code‡ 11-73	No. 31—May 19, 1949
Electrical transformers, etc.	127.0	131.6	147.7	148.0	156.9	162.0	Code‡ 11-74	No. 31—May 19, 1949
Engines (composite)	116.9	126.0	146.1	146.5	148.1	150.6	Code‡ 11-54	No. 36—June 23, 1949
Exchangers	130.0	140.0	152.0	165.8	174.9	175.9	Manufacturer	No. 2—Oct. 28, 1948
Fans and blowers	131.3	162.9	190.1	183.7	185.5	192.5	Code 11-47	Feb. 17, 1949§
Hand tools	125.2	143.2	154.2	155.1	165.4	171.1	Code 10-42	
Instruments (composite)	120.0	127.8	142.3	146.2	151.9	153.9	Manufacturer	No. 34—June 9, 1949
Flow meter (mechanical)		114.0	126.8	132.3	147.8	160.5	Manufacturer	No. 34—June 9, 1949
Flow meter (air control)		138.5	157.6	160.5	170.4	178.8	Manufacturer	No. 34—June 9, 1949
Flow meter (remote)		135.5	151.7	155.2	151.5	146.0	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point		134.0	146.6	151.5	157.8	162.0	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control		134.1	136.8	144.9	152.6	148.5	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder		135.6	153.3	158.4	163.7	166.3	Manufacturer	No. 34—June 9, 1949
Pressure gage		101.2	108.6	108.6	108.6	108.6	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)		124.0	144.3	149.4	152.6	152.3	Manufacturer	No. 34—June 9, 1949
Control Valve		133.3	155.5	155.5	162.5	162.0	Manufacturer	No. 34—June 9, 1949
Insulation materials	126.8	125.0	128.8	130.4	133.5	136.1	Code 13-72	
Lumber (composite)	181.0	193.0	208.5	203.2	201.1	195.0	Code 8-1	No. 7—Dec. 2, 1948
Lumber (Southern Pine)	174.3	176.9	189.1	191.2	189.6	178.8	Code 8-12	No. 7—Dec. 2, 1948
Lumber (other soft woods)	206.5	230.2	252.7	248.5	256.8	251.7	Code 8-13	
Machinery—general purposes	124.9	136.7	153.0	151.8	155.1	159.0	Code 11-4	Feb. 7, 1949§
Machinery—construction	127.8	140.1	155.3	157.5	162.3	165.2	Code 11-2	
Machinery—oil field	†125.9	†135.8	†149.6	†149.9	†156.3	†161.6	Code 11-51	
Paint and paint materials	143.0	136.9	153.9	151.9	150.9	. .	Code 6-2	No. 22—Mar. 17, 1949
Paints—prepared	141.4	140.0	153.8	155.7	156.7	159.0	Code 6-21	
Pipe, sewer	†119.1	†129.9	†147.1	†146.6	†150.6	†153.0	Code 13-45	No. 22—Mar. 17, 1949
Pumps, air compressors, etc.	127.0	138.2	155.9	155.6	162.5	166.3	Code‡ 11-41	No. 29—May 5, 1949
Steel (iron and steel)	141.1	152.9	166.7	168.5	177.4	176.4	Code 10-1	No. 61—Dec. 15, 1949
Steel—finished steel	160.4	182.6	196.9	201.2	216.6	222.9	Code 10-14	
Steel—plate and sheet		(See boilers, tanks, etc., above)						
Valves and fittings	†125.9	†135.8	. . .	¶190.8	193.1	199.3	Code‡ 11-49 (1-6 & 11-14)	No. 46—Sept. 1, 1949
Marshall-Stevens equipment (only) indexes:								
Process industries (average)	131.5	135.8	144.9	145.1	146.2	149.2	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Chemical	130.0	133.8	142.5	142.8	144.4	147.0	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Petroleum	132.0	136.5	145.6	146.0	147.8	150.5	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Electrical power	135.0	139.3	148.3	148.7	150.5	153.2	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Refrigeration	141.0	147.3	159.2	159.7	161.2	163.0	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Steam power	132.0	136.6	146.5	147.0	148.8	151.5	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Nelson Refinery Construction	132.5	146.2	157.2	163.6	173.5	176.9		No. 61—Dec. 15, 1949

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices." †Estimated base value for 1946. ‡Not exactly the same items as those published before July 7, 1952. §Questions on Technology, The Oil and Gas Journal. ¶Revised.

REFINERY PROCESS NEWS

PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY JUNE-JULY 1954

Patented Plug Valve Key to Orthoflow's Easy Operation

Unique mechanical features of Orthoflow Fluid catalytic crackers (of both the Model "A" and Model "B" design) are the plug valves which replace the more conventional slide valves. Designed and patented by Kellogg, they might well be termed the key to the decreased investment, easy operation and low maintenance cost of Orthoflow units.

Not only do the valves make feasible the elimination of expansion joints but they are also much more easily maintained than slide valves. Actually, the new valves make possible the basic advantage of the Orthoflow: Straight-line flow of catalyst with its concomitant reduction of the erosion problem.

The plug valves have proved so successful that it is seldom necessary to remove them. However, they are so arranged that they can be unflanged, lowered from the bottom head of the vessel, and taken to the shop for maintenance, if and when required, while the

rest of the unit is being inspected.

Although the plug of the valve is subjected to the same erosive material encountered in slide valves, Orthoflows in operation for as long as three years have proved remarkably free of erosion difficulties. The rate of erosion of the plugs is considerably less than in slide valves, and unlike slide valves where erosion results in loss of control over catalyst flow, plugs can erode without appreciably affecting operability. The plugs themselves are bolted in for easy replacement when required.

First Model "B" Orthoflow Proves Success of Design; Second on Stream

Having passed an intensive series of operational tests with flying colors—with design guarantees exceeded in every category—Kellogg's first Model "B" Orthoflow Fluid catalytic cracker has dramatically demonstrated the success of the new design. At the same time, a second Orthoflow of this type (shown in the illustration above) recently went on stream for the same refiner at another location.

As an example of actual test results obtained, the first Orthoflow unit has bettered its designed production capacity of 44 vol. % of debutanized gasoline. Since this test run, the gasoline yield on a somewhat better feed has exceeded 48%. The gasoline product has consistently rated higher than the design guarantee of 90 octane (CFR-R clear). At the same time, production of dry gas and butanes has been held to considerably less than the maximum allowances. Coke burning capacity has averaged almost 1500 pounds per hour more than the designed minimum, and catalyst loss has averaged 1.22 tons per day—considerably less than the guaranteed maximum.

One of two versions of Kellogg's exclusive Orthoflow design, the Model "B" differs from its predecessor, the Model "A", principally in the placement of the reactor and regenerator. Both feature straight-line catalyst flow and single-vessel construction, but in the Model "A" the reactor is above the regenerator and in the Model "B", the placement is reversed.

Process-wise, in addition to allowing a decrease in the size of the reactor, one result of placing the regenerator on top is that the latter can be operated at a lower pressure, effecting savings in direct operating costs since horsepower requirements for compressing regeneration air are reduced.

Thus, in the Model "A", pressure of about 18 pounds is required in the regenerator and about 10 pounds in the reactor in order to maintain optimum circulation of catalyst between the two zones. In the newer "B" design, reactor pressure is held at about 15 pounds while the regenerator operates at around seven pounds, retaining the same eight-pound differential but transferring the air compressor requirements to the lower pressure side of the operation.

(SEE REVERSE SIDE)

REFINERY PROCESS NEWS

CONTINUED FROM PRECEDING PAGE

Straight-Line Flow in Orthoflow Design Eliminates Erosion

While the Model "B" Orthoflow design is as yet too recent for the complete evaluation of long range operating characteristics such as erosion and maintenance requirements, experience with units of the earlier Model "A" design offers convincing evidence of what can be expected in the new design.

One of the principal features which sets both Orthoflow models apart from other Fluid catalytic crackers is straight-line flow of catalyst, made possible by single-vessel arrangement of reactor and regenerator. By eliminating curved external catalyst lines, decided reduction in erosion from the sand-blasting action of the catalyst has resulted. In contrast to side-by-side units where bends in the catalyst lines have actually worn through, Orthoflow units have been in operation for as long as three years with only negligible erosion in all lines including the high velocity riser.

Also related to straight-line flow is the ease of operation of Orthoflow units. Catalyst flow has actually been started up after shutdowns simply by turning on the air supply; stopping the units, or securing and maintaining catalyst flow after interruptions, have been equally easy. Since they are straight, the lines are self-draining on shutdown. Consequently the catalyst does not pack in the lines nor do the lines require a lengthy, inconvenient emptying out process before start-up as do older units.

Straight-line catalyst flow is also responsible for much of the lower initial cost of Orthoflow units. Aside from obvious savings in structural materials gained by combining reactor and regenerator, considerable additional savings result from the fact that no costly provisions for mechanical expansion joints are required. While pipes in the Orthoflow units operate at high temperatures just as in conventional units, expansion is far easier and less costly to compensate.

World's Largest Orthoflow . . .

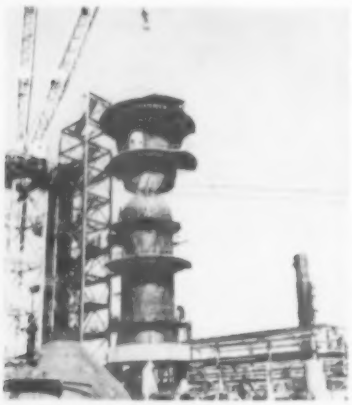
Shown above as it neared completion at the Atlantic Refining Company's Point Breeze refinery in Philadelphia is the largest Orthoflow Fluid catalytic cracking plant to be designed and built to date. This new unit is expected to go on stream early this summer.

Like other units described in this issue of "Refinery Process News," this Orthoflow is of Kellogg's Model "B" design. While other crackers of comparable or larger size have been built, they have all been designed with separate side-by-side vessels, one for the cracking reaction and the other for regeneration of catalyst.

The new Orthoflow for Atlantic has a reactor throughout of 45,000 barrels per day. It is one of a total of thirteen Orthoflows (including both "A" and "B" models) completed or underway since Kellogg first introduced the unique process design in 1951.

The first Orthoflow was erected as part of a combination refinery in Canada. This plant was followed in rapid succession by other larger units distributed in many parts of the world from Texas to Germany and Jugoslavia.

AUSTRALIA GETS AN ORTHOFLOW



Shown at the left is a recent view of the catalytic cracking area of a new 70,000 BPD refinery currently under construction in Western Australia by Kellogg International Corporation. The cracker is a Model "B" Orthoflow with a design capacity of 12,500 BPD.

As this photo was taken, the skirt assembly was being hoisted into place atop the reactor. Above the skirt will go the regenerator vessel, the head for which is shown in the foreground.

Four other Model "B" Orthoflow units are underway in the U. S. and Canada at the present.

For further information, technical data, etc., on any refining process, write

REFINERY PROCESS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, New York 7, N. Y.

Also Jersey City, Los Angeles, Tulsa, Houston, Toronto, London and Paris

KELLOGG PULLMAN

by W. L. Nelson
Technical Editor

What Aluminum Alloys Offer Refiners

ALTHOUGH the aluminum alloys are specifically resistant to the corrosive action of hydrogen sulfide, ammonia, and carbon dioxide, their resistance to many other corrosive conditions is not usually outstanding. Somewhat the same applies to other common materials such as carbon steel, cast iron, brasses, etc., and hence time is required to discover the particular applications or position that the aluminum alloys will occupy. With respect to instrument tubing, lightweight containers or transport equipment, coolers and exchangers for "sulfide"-laden liquids or gases, most types of insulation coverings, certain low-temperature services (—300° F.), and common rusting or oxidation, the usefulness of aluminum alloys is already clear. In those instances where strength is not significant as in many tubings, the aluminum alloys are cheaper than steel (and, of course, copper or brass).

The compositions of some of the more common aluminum alloys are shown in Table 1. Although chemical composition is significant, the condition in which the alloy is used or offered is also important. Cast alloy numbers are not followed by a letter, but wrought alloys carry the letter "S," as 3S, 14S, 51S, etc. If the alloys are annealed to give maximum softness, the letter "O" is used, as 52SO means annealed alloy 52S. "H" following the letter "S" indicated hardened by cold work and the degree of hardening can be designated as ¼, ½, etc., hardened.

Thus, 2S ½ means the wrought alloy 2 half hardened. The heat-treatable alloys are first heated long enough to attain a solid solution condition and are designated by the letter "W." After solution heat treatment they are then treated (or aged) to develop strength and hardness and such a condition is designated by the letter "T" as 11ST3 meaning wrought alloy No. 11 solution heat treated and aged by heat treatment No. 3. Finally, the heat treated alloys after treatment, can be strain hardened as 24 SRT.

In addition, a clad variety of tube has been found highly useful. About 10 per cent of the surface (that will be exposed to water) is integrally bonded with an aluminum alloy containing about 1 per cent zinc. The zinc alloy is anodic to the base alloy (often 3S) and provides protection against galvanic action in most waters.

Costs

The costs of various basic aluminum materials were tabulated in the Progress in Metals page of June 22, 1953. The approximate changes in price of some of these have been slight. (See Table 2; in cents per pound.) Meanwhile, steel prices have ranged from 2.5 to 9 cents per pound.

The cost of aluminum exchanger bundles is very much cheaper than the cost of brass bundles (with steel skeleton), according to Kerns and Baker (Pet. Refiner, May 1951, p. 123):

Sq. ft.	Dollars per sq. ft. Brass	Aluminum	Ratio
300	3.95	1.85	0.47
600	3.10	1.65	0.53
1,000	2.95	1.55	0.52
3,000	2.40	1.45	0.60
6,000	2.30	1.42	0.62

In covering insulation against the weather, 28-gage steel costs 6.6-7 cents per square foot, whereas aluminum sheet only 5.3-6.2 cents (ratio of 0.80). Alclad tubes used for condensers cost about half as much as admiralty metal (69 Cu, 29Zn, 1 Sn) tubes. The per foot cost of ¾-in.-diameter thin-wall tubing (0.04-in.) in the form of 2S or 3S alloy is cheaper than ordinary seamless steel tubing of the same thickness, however, as the diameter of the tubing increases or as its wall thickness is increased, steel tubing becomes cheaper (on a linear-foot basis).

TABLE 1—COMPOSITIONS OF THE MORE COMMON ALUMINUM ALLOYS

Alloy	Cu	Si	Mg	Others	AL
Strain-Hardening Wrought Alloys					
2S	.....	.....	.....	.....	*99
3S	†0.2	.....	.....	1.0-1.5 Mn	*97
52S	†0.7	.....	2.2-2.8	0.15-0.35 Cr	*96
Heat-Treatable Wrought Alloys					
14S	3.9-5.0	0.5-1.2	0.2-0.75	0.4-1.2 Mn	*92
17S	3.5-4.5	.....	0.2-0.75	0.4-1.0 Mn	*92
A17S	†2.5	.....	0.3	.....	...
24S	3.6-4.7	.....	1.25-1.75	0.3-0.9 Mn	*92
25S	3.9-5.0	0.5-1.2	†0.02	0.4-1.2 Mn	*92
A51S	†0.3	0.6-1.2	0.45-0.8	†0.02 Mn; 0.15-0.35 Cr	*96.5
53S	†0.05	0.5-0.9	1.1-1.4	0.2-0.3 Cr	*96
61S	.....	0.4-0.8	0.8-1.2	†0.35 Cr	*98
75S	1.2-2.0	0.5 max.	2.1-2.9	5.1-6.1 Zn;0.15-0.4 Cr; 0.1-0.3 Mn	.....
Casting Alloys					
13	.....	12.0	.....	.....	rest
43	.....	5.0	.....	.....	rest
85	4.0	5.0	.....	.....	rest
122	10	.....	0.2	1.2 Fe	rest
A132	0.8	12.0	1.0	0.8 Fe; 2.5 Ni	rest
142	4	.....	1.2	2.0 Ni	rest
195	4	.....	.....	.....	rest
B195	4.5	2.8	.....	.....	rest
214	.....	.....	3.75	.....	rest
A214	.....	.....	3.75	2.0 Zn	rest
220	.....	.....	10.0	.....	rest
355	1.25	5.0	0.5	.....	rest
356	.....	7.0	0.3	.....	rest

*Minimum. †Maximum.

TABLE 2—PRICE CHANGES IN VARIOUS TYPES OF ALUMINUM ALLOYS

	Ingot Index	Ingot Cost	Sheet 2S and 3S	Plate 2S and 3S	Tubing 52SO
1946	100.0	15.0	27.0	24.2	61.0
1947	100.0	15.0	27.0	24.2	61.0
1948	105.3	15.8	28.5	25.5	64.3
1949	113.2	17.0	30.0	27.0	67.5
1950	118.0	17.7	*31.5	*28.2	*71.0
1951	126.6	19.0	*33.5	*30.0	*74.5
1952 (Dec.)	133.3	20.0	*35.0	*31.0	*77.5

*Estimated.

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Midland, Texas	Dubach, Louisiana	Oklahoma City, Okla.	Newcastle, Wyoming
Nacona, Texas	Glendive, Montana	Sidney, Nebraska	Powell, Wyoming
	Wichita, Kansas	Hobbs, New Mexico	

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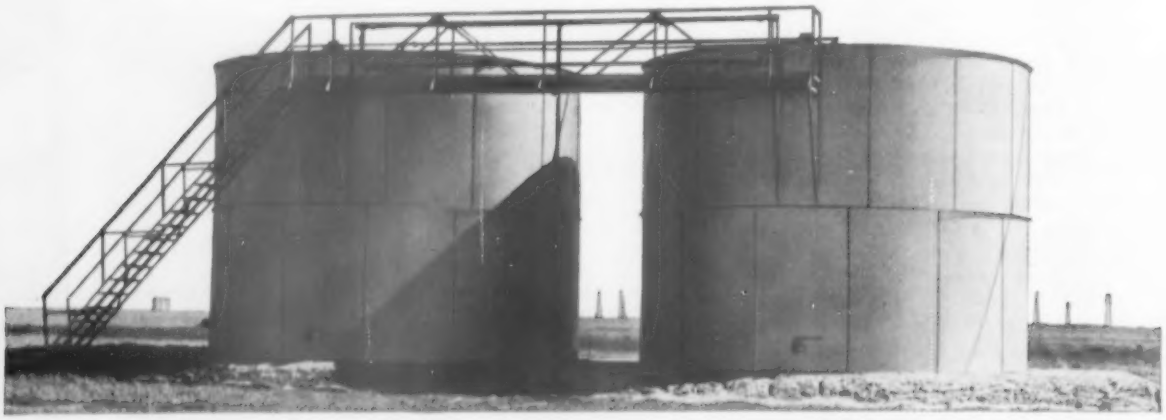

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Limestone Logging With Two-Electrode Normal

by R. I. Martin

SYMMETRICAL curves may be obtained if AN is long enough so that when A and M are in the bed, N will remain outside. In such a case $V_M - V_N$ is practically equal to the drop of potential between M and the upper boundary P. Therefore, Equation 2 of the previous installment may be written:

$$V_M - V_N = Rm \frac{MP}{S} \times I_1 \quad (1)$$

And again, replacing I_1 from Equation 1 of previous installment:

$$V_M - V_N = Rm \frac{MP}{S} \frac{AQ}{e} \times I \quad (2)$$

As for normal devices AM is small, MP may be replaced by AP.

$$V_M - V_N = Rm \frac{AP \times AQ}{Se} I \quad (3)$$

This expression will be a maximum when AP is equal to AQ. AP + AQ is always equal to e, and when they are equal to one another both equal e/2. The product $e^2/4$,

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

will be reduced to the first power by the e, in the denominator, so that $V_M - V_N$ is directly proportional to e the bed thickness. It should also be noted that the expression is symmetrical, so that although the apparent resistivity depends on the position of the electrodes in the bed, the resulting log is symmetrical with a maximum opposite the center of the bed.

As this is a more desirable type of curve it is often the practice to use a 10-in. normal device of this nature. The disturbing effect on the S.P. log of inductive coupling between A and M, previously mentioned, is not important when the formation resistivities are high.

Another example, which illustrates the sometimes peculiar behavior of the conventional devices, is shown in Fig. 1. This is a case where the resistant bed is not completely penetrated by the bore hole. The two curves are affected differently. For the normal curve, the current flow is almost entirely upward out of the hole. As long as both M_1 and N_1 are inside the hard formation they will record a constant high value.

In the case of the lateral device the current flow is again almost entirely upwards. That is, away from the pickup electrodes, until they reach the upper boundary. Consequently the apparent resistivity recorded is extremely small.

When the upper bed is also highly resistant, but less resistant than the lower, the curves may cross.

So far only homogeneous beds have been considered. When conductive layers are present the shapes of the curves may be deduced, and are shown in Fig. 2. The apparently contradictory indications of the curves should be noted. The depressions on the curves obtained with the normal device are very smooth and considerably broader than the bed thickness. The lateral curves show apparent maxima opposite the conductive beds, but actually, the depressions which are due to them are displaced downwards.

Editor's Note: Starting next week, this electric-logging series will be interrupted to present a feature on fluid displacement in secondary recovery by Dr. Ralph F. Nielsen, of Pennsylvania State College. Nielsen, who has been a frequent contributor to this page in the past, will present his material in six installments, and the electric-logging series will be resumed on completion of the series.

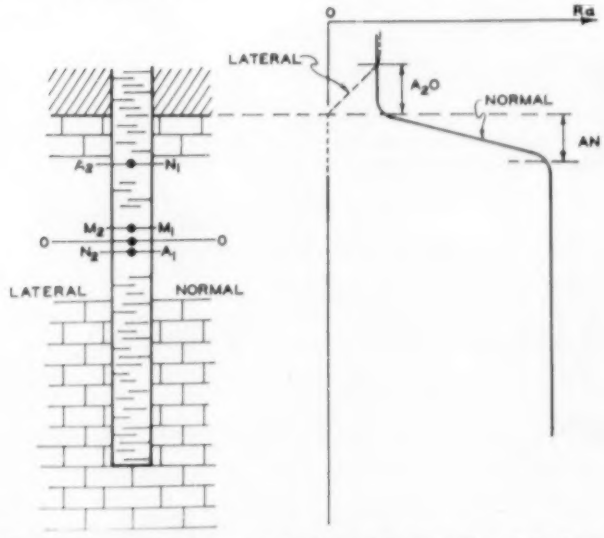

Fig. 1—Effect on logging curves for incomplete penetration of the formation by the bore hole.

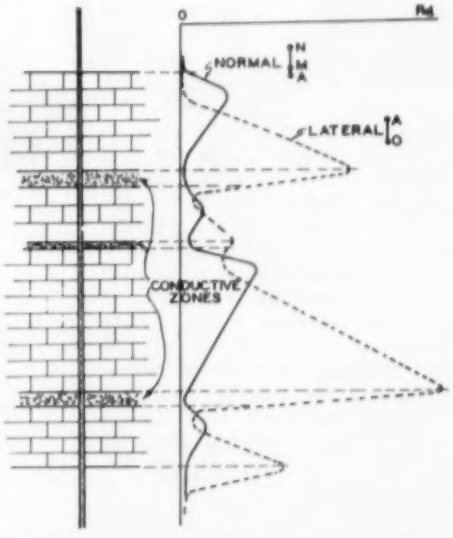

Fig. 2—Limestone with conductive zones. Courtesy Schlumberger Well Surveying Corp., Document 4.

Oxidation Stability of Jet Fuels—4

by J. W. Thompson

FIGS. 1-4 inclusive, presented in Installment No. 3, gave results of accelerated-oxidation tests run as: (1) soluble gum by air and steam-evaporation methods outlined in MIL-F-5624 A, and (2) the induction-period method.

From the curves, the concentration of each antioxidant required to reduce accelerated gum to a selected level was determined. Using these concentrations, "inhibitor replacement values" (parts of p-butylaminophenol replaced by one part of the test compound) were calculated as shown in Equation 1.

The other variation of the accelerated gum method involved bomb tests for varying times at a fixed antioxidant concentration. From curves of gum versus time, as illustrated in Fig. 3, the time in hours required for each composition to form a selected amount of gum ("gum time") was determined. These gum-time values at a selected gum level were used to calculate an "inhibitor ratio" for each antioxidant versus p-butylaminophenol as shown in Equation 2.

Induction-period method . . . This method was employed in the following manner. Induction periods were determined at varying antioxidant concentrations, then plotted against concentration to obtain curves, as illustrated in Fig. 4. These curves were used in two ways to compare the antioxidants. In the first, induction periods (IP) obtained at a selected concentration were used to calculate inhibitor ratios for the other compounds versus p-butylaminophenol as shown in Equation 3.

In the second variation, the antioxidant concentrations required to raise the induction periods to the same level were calculated from the curves. By substituting these concentrations in the following equation, "inhibitor replacement values" (parts of p-butylaminophenol replaced by one part of test compound) were obtained (Equation 4).

Author is with research laboratories, Tennessee Eastman Co., division of Eastman Kodak Co., Kingsport, Tenn.

Fuel Stability and Response to Antioxidants

The accelerated gum values in Table 1 (Installment No. 3) indicate that uninhibited jet fuels vary widely in stability and that fuels containing cracked stocks are less stable than straightrun fuels. Thus, fuels A and B passed the military specification test, but fuels C and D failed markedly. It is of interest to note that throughout the studies on these fuels the insoluble gum constituted only a very small fraction of accelerated gum, even at high gum levels.

As seen in Table 3 (Installment No. 3), insoluble gum values were on the order of 0.5 mg., or less, per 100 ml. of fuel. However, since insoluble gum is such an important factor in engine operation, it should not be concluded that these low insoluble gum values apply to jet fuels generally.

It was found that unstable jet fuels were very responsive to certain antioxidants and thus could be made to pass the 16-hour accelerated gum test. However, with both fuels C and D this required more than the specified maximum concentration of 1.0 lb. of approved antioxidant per 5,000 gal. of fuel. Fig. 2 (Installment No. 3), shows that the gum curves flatten considerably in the 20 mg. gum region, indicating that much larger amounts of antioxidant must be added to obtain further gum reduction.

Since fuels C and D contained substantial amounts of copper, as received, it might be expected that they would be inherently more stable as well as more responsive to antioxidants if this copper was either removed or deactivated. The quantities of fuel available prevented a complete study of this point. Limited tests indicated that addition of a commercial copper deactivator did improve fuel stability, either alone or in the presence of antioxidant. However, the uninhibited fuel, containing deactivator, still failed to pass the specification test for accelerated gum.

EQUATION NO. 1

$$\text{Inhibitor replacement value (gum-vs.-concentra ion method)} = \frac{\text{Concentration of p-butylaminophenol, weight per cent}}{\text{Concentration of test compound, weight per cent}}$$

EQUATION NO. 2

$$\text{Inhibitor ratio (gum-vs.-time method)} = \frac{\text{(Gum time for test compound, hr.)}-\text{(gum time for control, hr.)}}{\text{(Gum time for p-butylaminophenol, hr.)}-\text{(gum time for control, hr.)}}$$

EQUATION NO. 3

$$\text{Inhibitor ratio (induction-period method)} = \frac{\text{(IP of test compound, min.)}-\text{(IP of control, min.)}}{\text{(IP of p-butylaminophenol, min.)}-\text{(IP of control, min.)}}$$

EQUATION NO. 4

$$\text{Inhibitor replacement value (induction-period method)} = \frac{\text{Concentration of p-butylaminophenol, weight per cent}}{\text{Concentration of test compound, weight per cent}}$$

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INDIANA

Among the Drilling Contractors

New Drilling Company To Operate at Abilene

Melvin Dixon, H. O. Polston, and Russell E. Withrow, all formerly associated with AB-Tex Drilling Co., Abilene, Tex., have formed a new drilling partnership to operate as Dixon-Polston Drilling Co.

Dixon and Polston have been partners in AB-Tex Drilling Co. since it was organized in 1952. Withrow was their office manager in that company, but shares in the ownership of the new firm.

They have been active in the West Central Texas area.

Cook Drilling Co., Fort Worth, has taken on the job of cleaning out hole and carrying on testing and completion work in Carter Oil Co.'s indicated Smackover gas-condensate discovery well in northern Madison County, Mississippi. The well, 1 Brown, has been standing with drilling rig moved off since early in June 1953. Total depth is 12,487 ft. Completion has been delayed because of problems in producing the well's gas, having a high content of carbon dioxide and hydrogen sulfide.

Mohawk Drilling Co., Oklahoma City, contractor on Lang & Unger's new Wilcox oil-discovery well in the Seward area, 15 miles southwest of Guthrie, in southern Logan County, Oklahoma, is moving its rig about 3 miles to the north, in 15-15n-3w, for another wildcat test to be drilled for the same operators at 1 Bowan.

Cascade Drilling Co., Ltd., Calgary, Alta., is drilling on a new wildcat operation in the Bittern Lake area, 10 miles southwest of Camrose, in central Alberta Province. It is a contract job for Banff Oil, Ltd., of Calgary. Projected depth is 5,600 ft. Company designation is Banff Hazelwood 4-26, spot location being in LSD 4, 26-46-22w4.

Parker Drilling Co. of Canada, Ltd., Calgary, Alta., got one, and McIvor Drilling Co., also of Calgary, two of the three drilling contracts awarded by Oilwell Operators, Ltd., for tests in the Pembina area of West-Central Alberta Province. Parker will drill the company's Drayton Valley 4-16, in LSD 4, 16-49-7w5, inside Drayton Valley townsite, and about a mile from nearest production. McIvor will drill a southwest offset to Parker's job in LSD 16, 8, and also Pembina 12-13, in LSD 12, 13-48-8w5, ¾ mile east of the main Pembina development.

Southern Production Co., Dallas, is to drill California Co.'s hundredth well in Romere Pass field, in the Mississippi River delta marshes of southeastern Plaquemines Parish, Louisiana. The new well, 100 Romere Pass Unit, in 15-20s-19e, is scheduled as a 10,000-ft. test. The field was discovered in 1950.

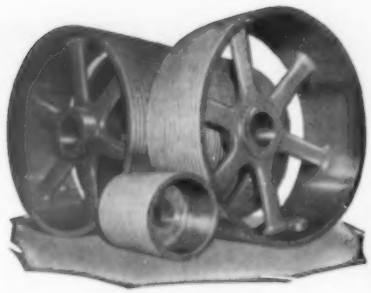
Wagner-Wyant Drilling Co., Amarillo, Tex., is scheduled to drill another well for Cabot Carbon Co. in the new East Sturgis Purdy-sand oil area, in the Keyes district, northwestern Texas County, Oklahoma Panhandle. It will be 1-D State, in 30-5n-10eCM, two locations south of the discovery well. Southeast offset and first confirmation well for the recent discovery now is being completed. Contract is 4,400 ft.

Glasscock Drilling Co., Shreveport, has a new deep test under way west of production in Jeanerette field, St. Mary Parish, Coastal Louisiana. It is being drilled for Lyons, McCord & Lagan, of Shreveport, at 1 Gonsoulin, in 68-13s-8e. Hole is projected to 10,500 ft.

Don Branyan Drilling Co. is contractor on a new wildcat test Inland Oil Co. is starting at 1 Durham, in 12-15n-2w, 8 miles southeast of Guthrie, in southern Logan County, Oklahoma.

Garvey Drilling Co., Wichita, Kans., is drilling for Carter Oil Co. on a projected 5,500-ft. Mississippian exploratory test southwest of Syracuse, in Hamilton County, extreme western Kansas. The well is carried as 1 Overton, with spot location in the NE NE SE 24-24s-41w.

Fortenberry Drilling Co., Natchez, Miss., will drill a 6,300-ft. Wilcox test at a wildcat location 2½ miles northeast of Stampley, in Jefferson County, Mississippi. It will be a contract job for Calto Oil Co. and G. W. Gulmon. Location is for 1 Allen, in 33-8n-1e.



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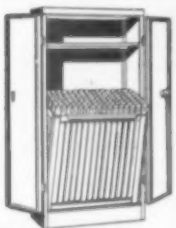

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PATENT NO. 1610368 Other Patents Pending

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Circle Drilling Co., Lake Charles, La., has contracted for a 6,850-ft. well to be drilled for Arnold H. Bruner at an outpost location on the south side of the old DeQuincy field, in northern Calcasieu Parish, southern Louisiana. Location is at 1-B McFatter, in 9-8s-11w.

Allen & Morris, San Antonio, will do the drilling on the wildcat test which L. A. Douglas and Greenbriar Oil Co. are undertaking at 1 Hoelscher, 2 miles northeast of Violet, west of Corpus Christi, in Nueces County, South Texas.

W. C. Fatjo Drilling Co., Lafayette, La., has contracted for another deep well which Harrel Oil Co. will put down at Port Barre, in St. Landry Parish, southern Louisiana. The well will be the operator's 2-A Sibille, and is spotted in 37-6s-6e. Contract calls for 9,200 ft.

Petersen Drilling Co., Shreveport, has a rig working for Gulf Refining Co. in Knoxville field, Franklin County, southern Mississippi. Current operation is at 1 Ashley, in 32-5n-1e, projected to the field's Wilcox pay around 6,600 ft.

Clinch Drilling Co., Jackson, Miss., is drilling on a new contract job, a 6,200-ft. Wilcox wildcat test, located north of Vidalia, in Concordia Parish, eastern Louisiana. Operators of the test, 1 Huff, in 46-8n-10e, are W. L. Billups and Gauthier & Heard.

Midwestern Drillers, Tulsa, and Liberal, Kans., will drill a 6,000-ft. wildcat test in southeastern Seward County, Kansas, about 13 miles east of Liberal. It is a contract job for Alladin Petroleum Corp., Wichita. Location, 1 Colvin, in 15-35s-31w, is near the Oklahoma line, about 3 miles east of Light field.

Sunnyland Contracting Co., Rayne, La., has contracted for a 6,000-ft. Tuscaloosa test to be drilled for Edward T. Merry, of Springhill, Ala., at a wildcat location 3½ miles southwest of Waynesboro, in Wayne County, eastern Mississippi. The test will be carried as 1 Masonite. Spot is in 26-8n-7w. Sunnyland also is under contract to Justiss-Mears Oil Co., of Jena, La., for a Wilcox well in the West Locust Hill area, Adams County, Mississippi. The new well, 2 U.S.A., in 6-5n-1w, will offset to the south Barnett Serio's discovery well, completed last November. Contract is for 6,800 ft.

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REFINING

Ashland to Build

Caustic regeneration unit scheduled at Catlettsburg

ASHLAND, Ky.—Ashland Oil & Refining Co. is adding a new caustic regeneration unit at the No. 2 refinery, Catlettsburg, Ky.

The unit will operate in conjunction with treating facilities for 18,000 bbl. per day of catalytic and straightrun gasoline and polymerization unit feed stock. Like the existing plant at the company's No. 1 Catlettsburg refinery, the new unit will employ a process for external oxidation of spent caustic, licensed by Electric Process Co. of Harrison, N. J.

Ashland is considering the construction of two similar caustic regeneration units at the Canton, Ohio, refinery and the Tonawanda, N. Y., plant of the subsidiary Frontier Oil Refining Corp.

Another Epco unit is being installed at the Cyril, Okla., refinery of Anderson-Prichard Oil Corp. to regenerate caustic used in treating 3,000 bbl. per day of thermal cracked gasoline and 600 bbl. per day of polymerization unit feed stock.

The new Epco process, developed by Charles W. Rippie and Howard B. Bishop, employs atomic oxygen generated in an electric cell, for oxidation of both hydrogen sulfide and mercaptan sulfur in an alkaline solution. The combined sulfur products are removed as liquid sulfur oils.

Esso Places Hydrofiners On Stream at Bayway Plant

NEW YORK.—Esso Standard Oil Co. has placed two new Hydrofiners on stream at its Bayway refinery at Linden, N. J.

The new units employ hydrogen from a ketone synthesis unit in the refinery to upgrade cracked distillate products. Dual facilities are capable of processing 7,640 bbl. per day of heavy thermal naphtha and 19,520 bbl. per day of cracked heating oil.

The Hydrofining process is licensed by Standard Oil Development Co.

The Bayway units are the sixth and seventh Hydrofiners to be brought on stream in refineries affiliated with Standard Oil Co. (N.J.). Already in operation are a Hydrofiner processing wax at Bayonne, N. J.; a large 20,000-bbl. per day plant hydrogenating heating oil at Baytown, Tex.; a small unit treating lubes at Sarnia, Canada; and two Hydrofiners upgrading tractor fuel and solvent naphtha at Fawley, England.

Work Started on Union's Coking Site at Nipomo

NIPOMO, Calif. — Two contracting companies have begun leveling the $5 million site for Union Oil Co. of California's coking plant here for Bechtel Corp., the general contractor.

Date for construction of the plant has not been set although Union has

NELSON REFINERY CONSTRUCTION INDEX

Appears on the Refining page in the first issue each month.
Compiled by W. L. Nelson—Petroleum Refinery Consultant—Tulsa.
The Index was explained July 7, 1952 (p. 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

INDEX (1946 = 100)

	1948	1950	1951	1952	1953	Mar. 1954
Pumps, compressors, etc.	127.0	138.2	155.9	155.6	162.5	166.3
Electrical machinery	127.6	134.9	154.3	152.4	156.4	160.7
Internal combustion engines	116.9	126.0	146.1	146.5	148.1	150.6
Instruments	120.0	127.8	142.3	146.2	151.8	154.0
Heat exchangers	130.0	140.0	152.0	165.8	174.9	175.9
Miscellaneous equipment average	*122.1	*126.2	*145.1	153.3	158.8	161.5
Materials component	139.3	149.5	164.0	164.3	172.4	172.0
Labor component	128.0	144.0	152.5	163.1	174.2	180.2
Refinery Construction Index	132.5	146.2	157.2	163.6	173.5	176.9

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of the miscellaneous equipment items shown above.

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said it expects to have the unit in operation by March 1955. The new coker is a part of Union's $40 million expansion program.

Site Clearing Finished At Shell's New Refinery

ANACORTES, Wash.—Site clearing for Shell Oil Co.'s 50,000-bbl. refinery near here has been finished and other construction work is proceeding according to schedule.

To provide for quick completion of the plant, the construction has been divided into two stages. The installation of the crude distillation unit and a Platformer with all auxiliary units is the first stage.

The second stage calls for installation of a feed preparation unit, a catalytic cracking unit, and a catalytic polymerization unit. The first stage of construction is scheduled for completion in August 1955 and the second stage for December 1955.

Petrochemicals

Cyclics Still Gaining

Three Intermediates show large production increases

NEW YORK. — Three cyclic intermediate chemicals produced wholly or partly from petroleum showed substantial production gains last year.

According to the 1953 survey of synthetic organic chemicals conducted by the U. S. Tariff Commission the output of styrene, the principal synthetic rubber intermediate, was 798,433,000 lb., an increase of 12.5 per cent over the 1952 output.

Cyclohexane, produced by Shell Chemical Co., Richfield Oil Corp., Phillips Chemical Co., Humble Oil & Refining Co. and others, showed a 19 per cent jump, with 299,578,000 lb. as compared with 252,384,000 lb. in 1952. The growing detergent demand was reflected in a 30 per cent increase in the production of dodecylbenzene from 206,588,000 lb. in 1952 to 297,286,000 lb. in 1953. This intermediate is produced by Monsanto Chemical Co., Shell Oil Co., Atlantic Refining Co., Allied Chemical & Dye Corp., Standard Oil Co. of California, and Continental Oil Co.

Refined cresylic acid, produced by Magnolia Petroleum Co., Socony-Vacuum Oil Co., Shell, California Standard, and several chemical and coal tar companies, registered a decline, from 30,279,000 lb. in 1952 to 21,021,000 lb. last year.

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New scraper detector offers operational advantages

by Scott E. M. Hood

Fig. 1—Scraper detector installed on line. Cable is for remote annunciator.

A MECHANICAL scraper detector of new design was installed recently by Texas-Empire Pipe Line Co. at its Sand Springs, Okla., station. One of the detectors, placed upstream from the station, automatically shuts the station down; the other detector, downstream from the station, gives a positive indication that the scraper has passed. By the use of these detectors, the station down time is held at a minimum during line-scraping operations.

Fig. 1 shows the detector as it is installed on the pipeline downstream from the station. The detector has a visual indicator mounted on it as well as a microswitch. Actuation of the microswitch rings a bell inside the station when the scraper passes this point.

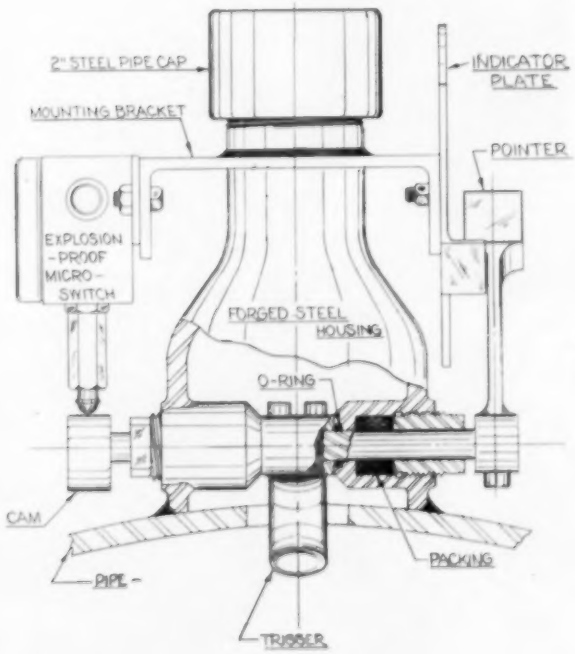
The other detector was mounted in the same manner except that the visual indicator was replaced by a spring automatic reset and the microswitch was connected electrically to the station shutdown system. The protective steel box, with a suitable cover, as shown in Fig. 1, makes the detector accessible at all times and also protects it from the weather.

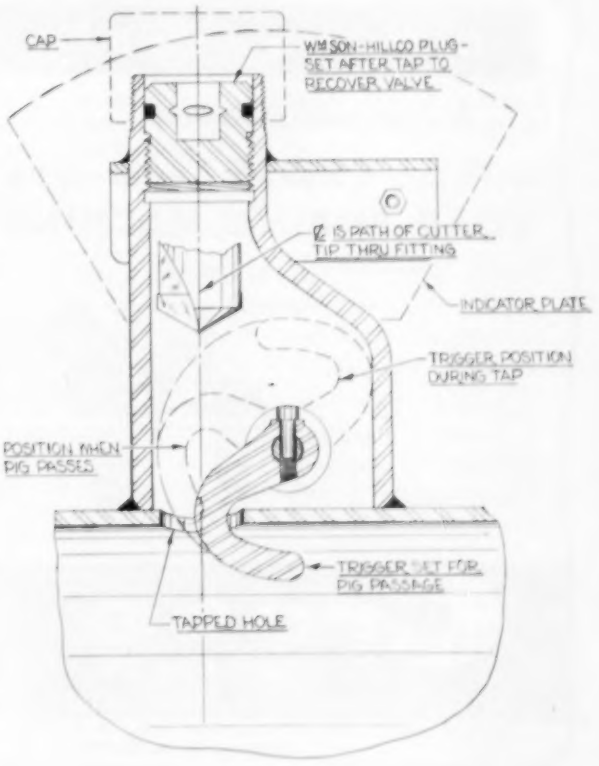
Author is assistant division manager, Southern Division, Texas-Empire Pipe Line Co.

How it works . . . Basically, the scraper detector consists of a pressure-tight housing which is welded to the pipeline, a trigger which hangs within the pipe, and external indicators which are operated by movement of the trigger (see Fig. 2).

A scraper, in passing the detector, moves the trigger up and out of the pipe, which in turn causes the pointer to move to the "P" or "passed" position. At the same time, the rotation of

Figs. 2 and 3—Front and side views of scraper detector. Note that pointer may be replaced by spring for automatic inset.

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the shaft causes the cam to close contacts in the microswitch. Closing of these contacts may be used to initiate a variety of control or signal operations. If desired, a simple spring arrangement may be installed on the shaft in place of the visual pointer. This spring arrangement will automatically reset the detector after a scraper passes.

Pressure is related in the housing by an O-ring seal on each side of the trigger, chevron packing around the shaft, and an O-ring seal on the top plug (see Figs. 2 and 3). Designed maximum working pressure is 1,200 psi.

Installation . . . The detector may be connected to pipelines of any size from 4 to 34 in., and of any wall thickness up to ½ in. Installation may be made on lines in service with no interruption in flow. In installing the detector, the housing is first welded to the pipe and a 2-in. full-opening valve is threaded to the top of the housing. A conventional tapping machine is then connected to the valve and a 1⅝-in. hole is cut in the pipe. During tapping operations, the trigger must be rotated away from the pipe as shown in Fig. 3.

Next, the cutter head is removed from the tapping machine and the machine is used to insert a plug through the valves and into the top of the housing. The tapping machine and valve are then removed and a 2-in. steel pipe cap is threaded on the housing. The final step is to rotate the trigger down into the pipe and mount the electrical or visual indicator. The protective steel box may be welded on the pipe either before or after the installation of the detector.

Operational advantages . . . There are many operational advantages which may be gained by the installation of the detector, one of the main ones being the elimination of all unnecessary station down time in the passage of scrapers. By the addition of suitable remote signaling apparatus, operators can be warned as the scraper approaches a station, can shut the station down, and then restart it as soon as a second signal indicates that the scraper has passed the station. This can be further expanded to perform automatic shutdown and restarting of stations.

At the Sand Springs station the upstream detector is installed 1,870 ft. ahead of the main-line tiein with the station suction line (see Fig. 4). Placement of the detector this far from the

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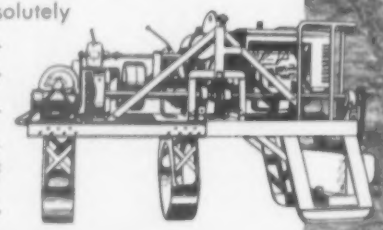

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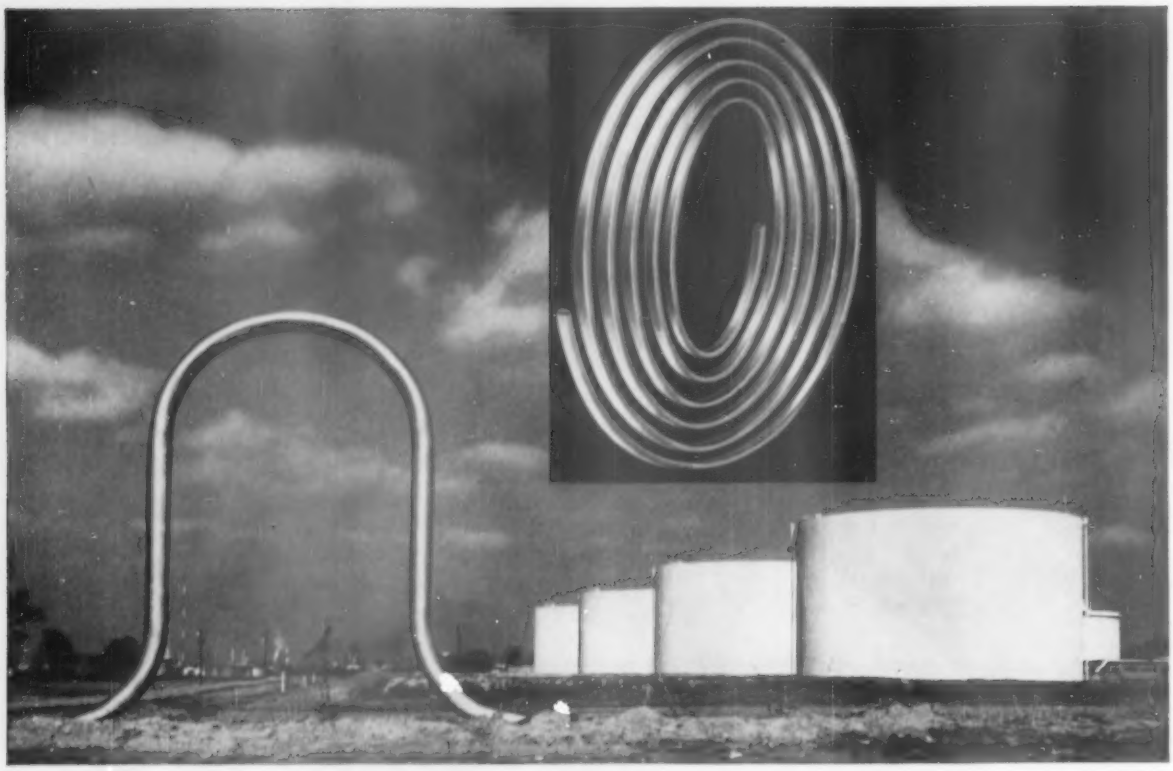

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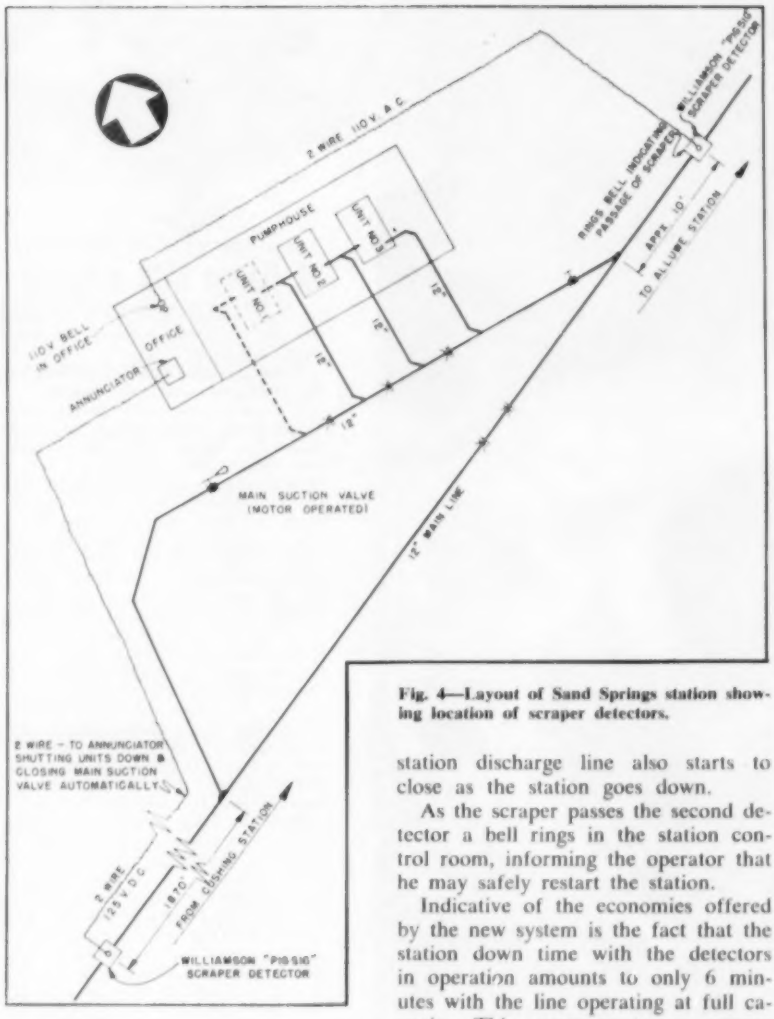
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WILLIAMSON "PIGGIE" SCRAPER DETECTOR

Fig. 4—Layout of Sand Springs station showing location of scraper detectors.

suction line allows ample time for the station to be shut down and the suction valve to be closed before the scraper's arrival, even when the line is operating at maximum capacity. The distance is also great enough to keep debris ahead of the scraper from entering the suction manifold, station valves, and pumps.

The downstream detector is installed immediately past the station since it is desirable to restart the station as soon as the scraper passes the discharge-line tiein.

A two-wire line from switch contacts on the upstream detector is connected into the emergency shutdown system of the station. As the scraper passes, these contacts operate, thereby causing associated contacts in the holding-coil circuit of the unit breakers to open, shutting down all units.

At the same time other relays are energized which causes the motor-driven suction valve to start closing. The air-operated throttle valve in the station discharge line also starts to close as the station goes down.

As the scraper passes the second detector a bell rings in the station control room, informing the operator that he may safely restart the station.

Indicative of the economies offered by the new system is the fact that the station down time with the detectors in operation amounts to only 6 minutes with the line operating at full capacity. This compares to an average down time of 40 minutes before installation of the detectors.

Course on Oil-Well Drilling Fluids Offered by Texas University

A special graduate course on "The Composition and Properties of Oil-Well Drilling Fluids" will be offered under the Institute for Advanced Engineering at University of Texas in the interval between August 26 and September 15, 1954.

Walter F. Rogers, chief chemist, Gulf Oil Corp.'s Houston production division, will be the principal lecturer. Prof. H. H. Power of the Department of Petroleum Engineering, colecturer, and six experts from industry will also take an active part in the program.

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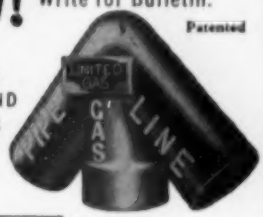

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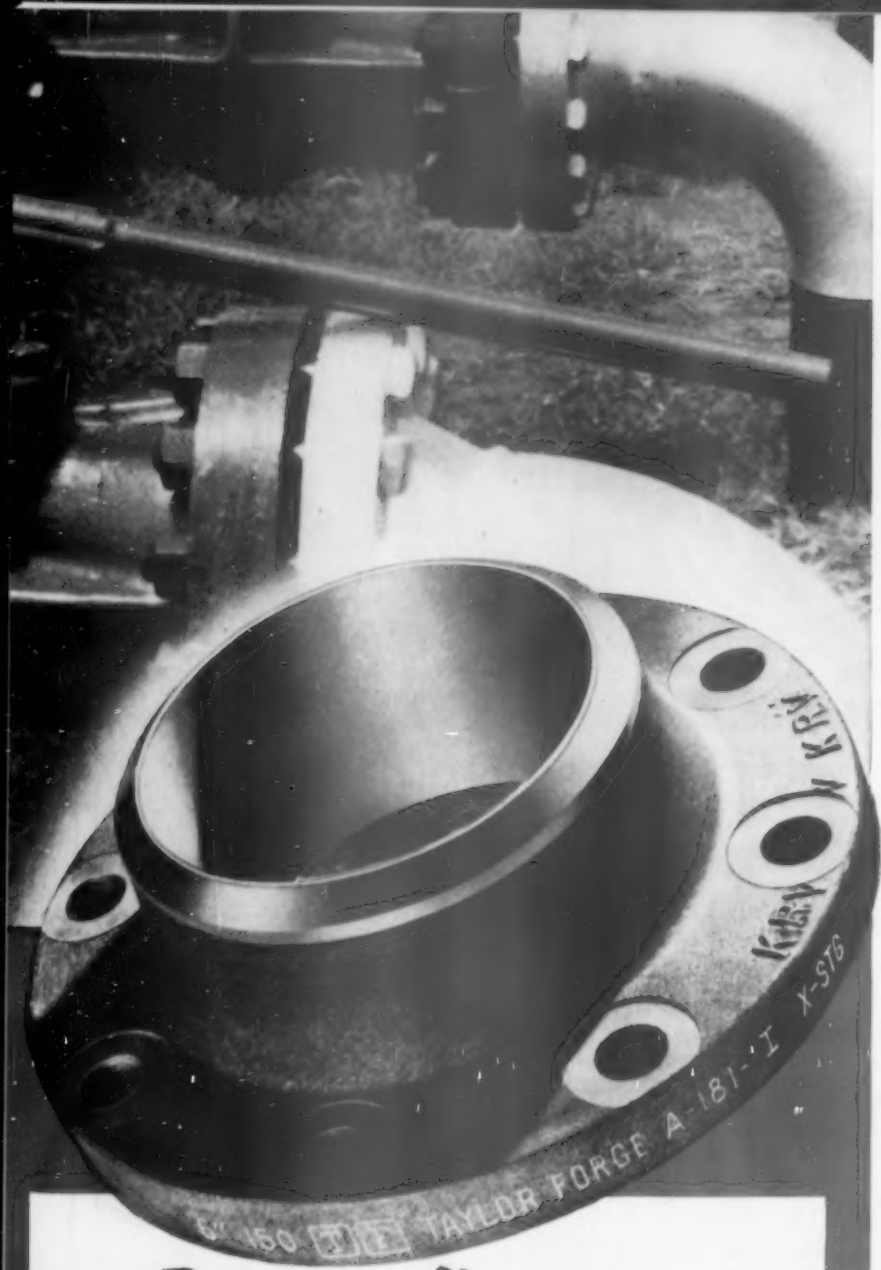

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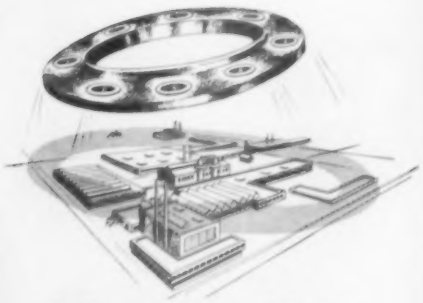

A flange with a future—

Even though no one knew it at the time, the year 1905 was a significant year for Taylor Forge.

It was the year that Taylor Forge began the making of forged steel flanges.

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It was also apparent that the forging of flanges had taken Taylor Forge into the dawning field of designed piping. Pressures were beginning to climb. Knowledge of how to contain them was needed. By 1920, the late J. Hall Taylor and his associates began the intensive research that was to make Taylor Forge not only the world's largest manufacturer of forged steel flanges, but also the foremost contributor to flange design and standards.

In the mid-20's, big strides were made in flange development to meet the broadened needs of the growing petroleum industry. By 1927, as the reward of long, intensive research, the authoritative Taylor-Waters formula was published. This research work demonstrated the design advantages of the hub type flange and provided the means for producing flanges accurately proportioned for strength combined with economy.

Most of this research had been concerned with the American Standards—flange sizes through 24"—but in 1938 Taylor Forge published the first edition of its widely consulted "Modern Flange Design," based on methods proposed by E. O. Waters, D. B. Rossheim, D. B. Wesstrom and F. S. G. Williams, manager engineering standards, Taylor Forge (ASME Trans. Apr. 1937). It provided the first complete analyses of the effects of tapered hubs on flange strength and thus opened the way to predetermine design requirements of flanges of all types.

(An episode in the story of Taylor Forge leadership in designed piping)

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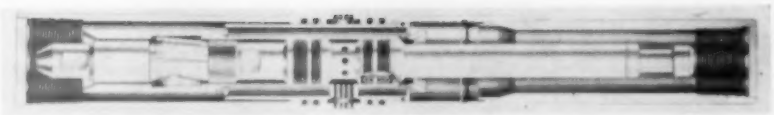
by Dan B. Miller



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The gas-lift valve seats inside the sleeve, with its latching mechanism engaged in a machined recess. The valve has two sets of V-type packing that seal above and below the gas inlet port in the sleeve, so that injection gas entering from the casing is directed through ports in the valve body and thence into the tubing.

When a gas-lift valve is being removed, the sliding sleeve moves to its closed position before the shear pin releases the valve. Conversely, a valve being installed is seated, sealed, and locked before the sleeve moves to open position. This eliminates all undesired communication between the casing and tubing. It is never necessary to equalize pressure and only one trip is required to remove or install a valve. *Garrett Oil Tools, Inc.*

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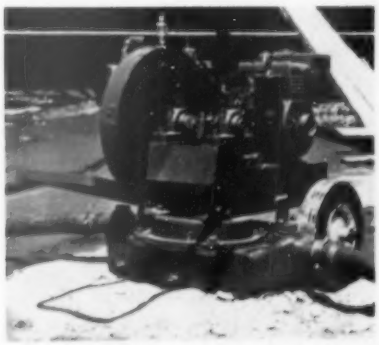

Redesigned Pumps Offer Substantial Size Reduction

This new lightweight pump is considerably stronger and more compact than the original models first introduced 2 years ago. Two sizes are available. The smallest, Model 202A, is used with 2-in. hose and handles up to 3,000 g.p.h. The 3-in. size, Model 302A, removes up to 3,300 gal. of seepage water per hour. Both models are used primarily for muddy or sandy ditch or pit work. They are self-priming and operate on suction lifts up to 20 ft. They can be used with total liquid heads not exceeding 40 ft. of water.

As compared with previous models, one of the most obvious improvements is the substantial reduction in size. The new pump measures 45½ in. long, 29½ in. wide, and 30½ in. high. This is 2½ in. shorter and 6½ in. lower than the original models. The saving in size was accomplished by moving the chain drive from a vertical position to a horizontal position. This also resulted in lowering the pump shaft, making the assembly much more rigid. Vibration has been reduced and is now almost unnoticeable.

Power for both models is provided by a Model 8-R6 Briggs & Stratton engine, developing 2 hp. of continuous-duty usable power. The engine is mounted on a sliding frame to provide regulation for tightening the chain. Adjustment is easily made by turning only one screw. The entire assembly is solidly bolted to a rigid welded-steel chassis and then mounted on two heavy-duty rubber tires. The pump can be conveniently carried in a small pick-up truck and easily moved about on rough and muddy locations. *Marlow Pumps.*

Check No. 2 On The Time Saver Card

●

Infrared Analyzer Tested In Oil-Field Applications

Successfully used in a wide variety of field applications, the multistream, plant-type, Infrared Analyzer employs an optical system of the double-beam, filter photometer type using non-selective detectors. Completely automatic, it can be used to cyclically monitor as many as five process streams for a single component or group of components. Alternately, it can utilize continuous single-stream analysis for direct-process control. Housed in dual bells designed and tested to be explosionproof for Class I, Group B, hazardous locations, the entire mount requires a floor space of about 4 by 6 ft.

Periodic, automatic standardization is employed to compensate for ambient temperature and barometric fluctuations. Information from the unit can be telemetered any reasonable distance from a low impedance output designed to minimize possible stray pickup.

What's New... Use the handy Time-Saver Cards

Sampling system design and components can be supplied with the instruments.

The analyzers are available by direct purchase or on a rental basis with optional subsequent purchase. Complete sampling system design and maintenance services are supplied on rental equipment. *Instrument Sales Division, Phillips Petroleum Co.*

Check No. 3 On The Time Saver Card

●

Equitable Introduces 32-Ft. Crew Boat

The new Equity 32-ft. all-steel diesel water taxi supplements Equitable's present line of standard-made crew boats which will now include 23, 32, 38, and 51-ft. water taxis. The 32 and 38-ft. can also be furnished to meet the Coast Guard's requirements for carrying passengers for hire. The new 32-footer is constructed of an all-steel (10 and 12 gage) hull and cabin, and can be furnished with either gasoline or diesel power in either the single or twin-screw types. It has speeds ranging from 15 to 35 m.p.m.

Its dimensions are: lengths over-all 32 ft.; breadth 10 ft. 6 in.; depth molded 5 ft. The draft when loaded is only 2 ft. 9 in., and the displacement when light is 6.5 tons, when loaded 7.5 tons. *Equitable Equipment Co., Inc.*

Check No. 4 On The Time Saver Card

●

Gage Line Wiper Stays In Hatch Hole of Tank

A new device for saving time and avoiding hazards from oil blowing over tank deck and walk is a metal and synthetic-rubber combination designed compactly into a gage line wiper. It is easily installed in the hatch hole of the tank by means of a rigid bracket with slotted hole for hatch bolt and adjustment. The gage line is reeled in through the wiper, which effects thorough cleaning of both line and plumb bob.

The wiper does not interfere with gaging or thieving operations and it's out of sight when the hatch cover is closed. Thumb screw is provided for adjusting the inset compression rubber to obtain maximum wiping action. The gager never has to touch the wiper nor does he have to handle the line while it is being reeled in. The wiper has guide for the line which keeps line in place while being reeled in and wiped. Guide also acts as ground against static electricity. *Grip-Tite Manufacturing Co.*

Check No. 5 On The Time Saver Card

●

Light, Flexible Oil Hose Makes Dockside Work Easy

A new lightweight, flexible oil hose for use in loading and unloading tankers and barges and other dockside operations uses lightweight steel nipples and is one-third the weight of conventional types. Further savings in weight can be achieved through the use of aluminum flanges. The hose is called Amazon oil discharge hose.

Although it has a working pressure of 200 psi., and a safety factor five times as great, the hose can be bent and kinked without damage and instantly springs back to shape. It is exceptionally adaptable to bunkering service. Often bunker headers are placed in awkward locations and the light, flexible hose can be worked into position with less handling equipment and less manpower than rigid, conventional types. Its shorter bending radius makes it easier to use in cramped dock conditions.

It is available in sizes ranging from 3 to 12-in. i.d. Its neoprene tube and cover make it oil resistant and give it good resistance to aging and the damaging effect of sunlight. *United States Rubber Co.*

Check No. 6 On The Time Saver Card

●

Velocity Cables Speed Uphole Surveys

New velocity cables are equipped with 12 to 20 detectors to give a corresponding number of recordings per shot, saving time on uphole surveys.

With velocity cable most holes may be completely surveyed with one or two shallow shots, saving the surveyed hole for reflection shots. Interpretation of the velocity record is simplified with the use of the cable since shot energy travels faster through the earth than along the cables and special materials and construction make the cable velocity very low. The low cable velocity also allows the shallow shot to be

UNIVERSAL TRENCHER

MODEL "3A-48"

Mounted on Oliver Model "OC-3" Crawler Tractor

If you are feeling the pinch of competition in trenching contracts investigate UNIVERSAL TRENCHER.

If your trenching needs require a trencher digging four feet or less with width of 14", 16" or 18" here is a piece of equipment you'll want to consider.

UNIVERSAL TRENCHER is heavy-duty. It is assembled on Aircraft Precision jigs, yet costs less than comparable equipment.

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IT IS ECONOMICAL; More trenching feet per hour

IT IS MANEUVERABLE; Gets you into tighter places and will cross trench

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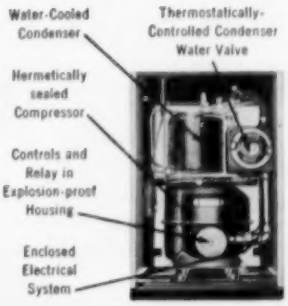

Temprite explosion-proof water coolers are *essential* in a long list of potentially combustible factory atmospheres. Invariably these dangerous atmospheres also contribute to thirst with coal dust, grain dust or wood dust floating in suspension. Underwriters' approved for Class I, groups C and D; Class II, groups F and G; and Class III of the NEMA Code. Write now for details.

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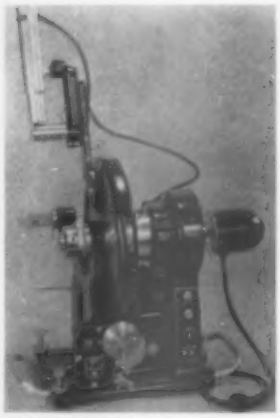
placed near enough to the surveyed hole to eliminate angularity corrections.

Velocity cables are made to order, making it possible for the customer to specify stress-member size, number of pairs, number of detectors per trace, number of traces, total length, cable below last detector, and any desired interval spacing. *Vector Manufacturing Co.*

Check No. 7 On The Time Saver Card

Goniometer Features X-Ray Optical Arrangement

The new wide-range and low-angle Goniometer is designed for use in conjunction with the basic X-ray diffraction unit, electronic circuit panel, and automatic recorder. It is designed for Geiger counter analysis with high precision of the drive gear assembly of 0.0025°. It is arranged for direct reading and has an unusually large, uninterrupted scanning range.



Quickly adjustable limit-stops for high and low angles are arranged to prevent overtravel at extremes of the scale. Construction permits simultaneous use of up to three cameras or two cameras and another goniometer while diffractometer is functioning. A clear space with a radius of 3⅞ in. is provided for mounting special heating or cooling chambers as well as special specimen holders. The mechanical shutter for radiation-beam cutoff is standard.

One of the most important features of the instrument is its X-ray optical arrangement. When the line focus is viewed at 3° its effective size is 0.06 by 10 mm., thus providing a fine slit source and employing the entire focal spot area, giving dual advantages of intensity and resolution. The instrument is designed for flat specimens of 10 by 20 mm. Smaller specimens may be used by reducing the size of the divergence slit. The use of a flat rather than a curved specimen produces no significant errors and is a convenience. *Southwestern Electronics Corp.*

Check No. 8 On The Time Saver Card

THE WmSON PIG-SIG . . .

signals the passage of all pipeline scrapers

PIG SIG

INSTALLING A PIG-SIG . . .
1. WELD the housing to pipe.
2. DRILL a hole into pipe with Tapping Machine.

ALL WITHOUT SHUTDOWN OR LEAKAGE of pipeline in service

The Pig-Sig is a mechanical device welded to pipelines to indicate the arrival or departure of any pipeline scraper, pig, or swab. A hole is tapped in the line (under pressure) using a standard **WmSON-HILLCO TAPPING MACHINE.** The trigger, extending down through tapped hole, is tripped when scraper passes, actuating a visual signal or an electrical indicator (micro switch).

PIG-SIGS cut operating costs . . .
- a. Reduce down-time of booster stations
- b. Save man-hours searching and waiting for scrapers

Tested to 1500 p.s.i. shaft is sealed with O-Rings and Chevron packing.

T. D. Williamson, Inc.
THE PIG WITH THE POKE CLEANS PIPE LINES
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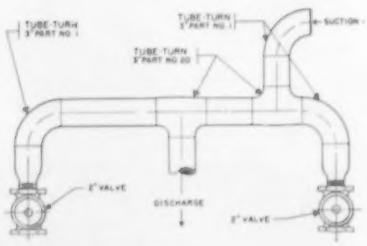
REPRESENTATIVES . . . HOUSTON • BATON ROUGE • PITTSBURGH • KENILWORTH, N. J. AMARILLO • CASPER • PROVO, UTAH • LOS ANGELES • OAKLAND • EDMONTON CALGARY • TORONTO • BUENOS AIRES • DURBAN, NATAL, SOUTH AFRICA

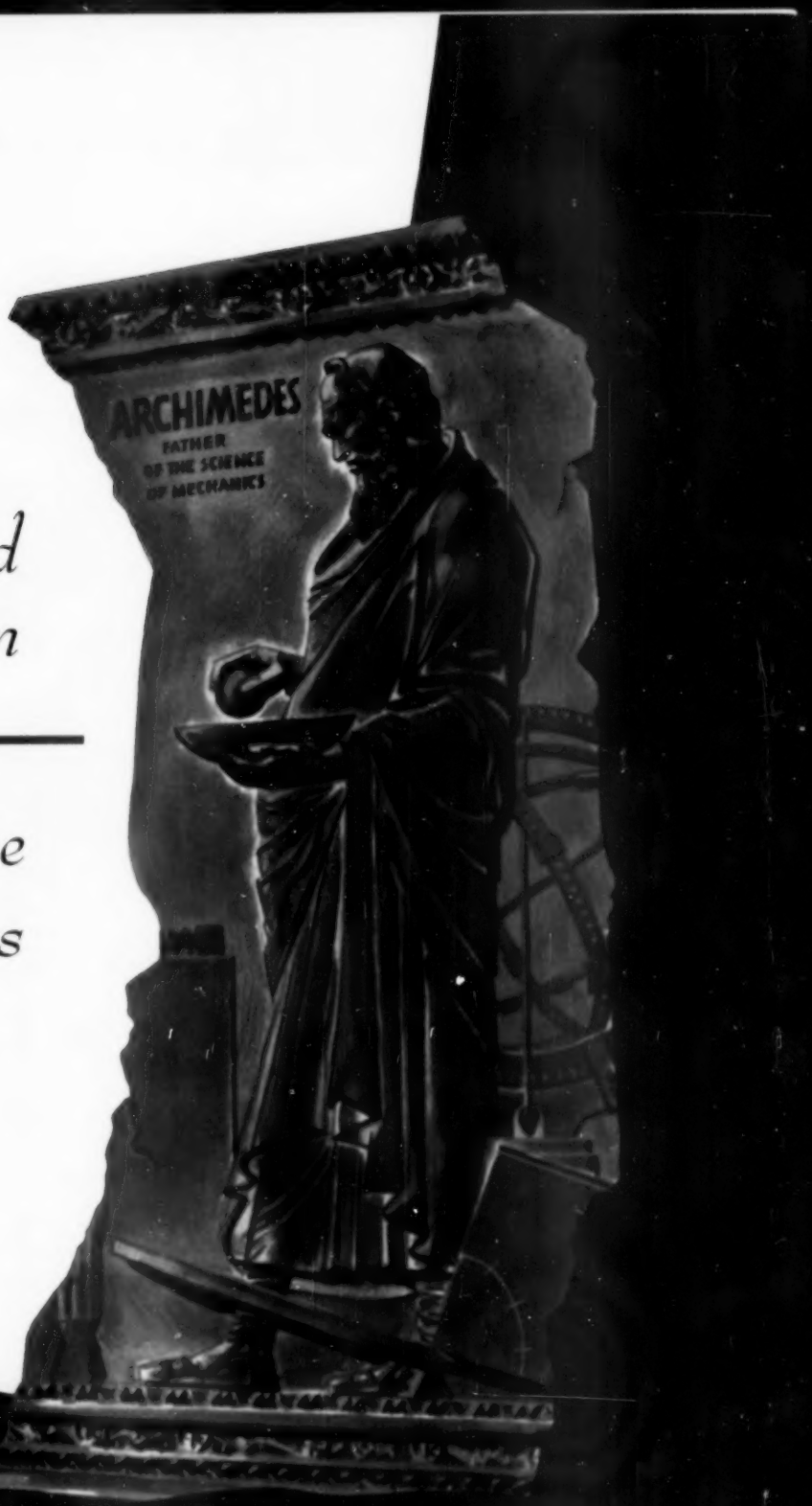


LPG Manifold is Designed For Truck Field Deliveries

An improved suction and discharge manifold is used on tank trucks that make deliveries of propane and butane to commercial and oil-field customers.

Advanced design

the cornerstone of success



The priceless quality of being unwilling to acknowledge defeat or admit that any problem must remain unsolved, together with the daring to enterprise, is the foundation of progress.

Fluid Packed Pump Company, since its inception thirty years ago, has been guided by this principle in meeting the challenge of a growing industry, and its organization has been made to include every engineering qualification, every skill, and the equipment essential to a complete down-well pump service.

Advanced product design, brought about through the ingenuity of Fluid Packed Pump Company craftsmen, has resulted in operating economies of vital importance to the industry. Multiple Tube Pumps, One-Piece Hardened and Honed Steel Barrels, Carbide Valves, and the Rod Weight Compensator are typical of Fluid Packed Pump Company's progress and are symbolic of things to come.

FLUID PACKED PUMP COMPANY

Main Office and Plant, Los Nietos, Calif. • Distributed by the National Supply Co., Pittsburgh, Pennsylvania. Export: The National Supply Co., Inc., Export Division, 600 Fifth Avenue, New York • Co-Distributors: Berry Supply Store, Beacon Supply Co., Industrial Supply Co.

What's New... Use the handy Time-Saver Cards

Its directional changes are made with welding fittings, rather than with screwed fittings. The design calls for three 3-in. Tube-Turn elbows and two 3-in. Tube-Turn barrel-shaped tees. They make possible joints that remain permanently drum-tight under the vibration stresses imposed by road conditions, and minimize pressure drop. *Sacra Brothers.*

Check No. 9 On The Time Caver Card

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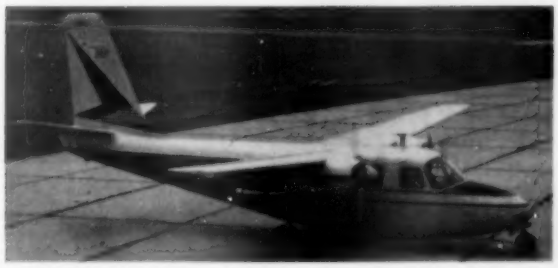

New Commander Features Swept-Tail

A new swept-tail model of the Aero Commander has been designated as Model 560, and is already in production. Featuring a new swept-tail, the Model 560 offers practical advantages in the way of greater stability and increased controllability, especially at low speeds.

Powered by two Lycoming GO-480-B geared engines, the Commander's cruise performance has been stepped up to 200 m.p.h., at 5,500 lb. With a takeoff rating of 270 hp., the GO-480-B engines have a continuous rating of 260 hp., and are equipped with chrome-plated rings for longer service life. Cooling is provided through an augmented system.

Top speed of the new model, under maximum performance category (5,500 lb.), is 209 m.p.h. Service ceiling is 22,000 ft. Under maximum load category (6,000 lb.) service ceiling with one engine feathered is 8,000 ft. Two engine rate-of-climb, at sea level and at 6,000 lb. gross, is 1,400 ft. per minute with one engine feathered.

Gross load has been increased to 6,000 lb., thus providing greater utility. Included as standard equipment are dual generators, an emergency exit, internal control locks, a tow bar, Hartzell all-metal full-feather propellers, a full set of blind-flight instruments, and a Lear LTRA-6 radio. *Aero Design & Engineering Co.*

Check No. 10 On The Time Saver Card

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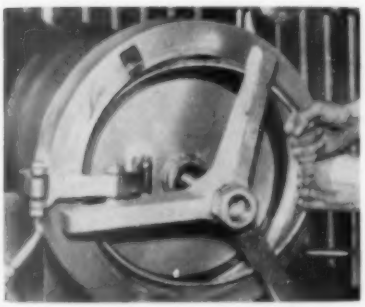

New Closures are Adaptable To Both Piping and Vessels

An entirely new type pressure closure for all types of pressure vessels and piping systems, the Flex-Ring closure, incorporates an internal pressure closing, metal-to-metal seal principle. It seals tighter as the pressure upon it increases.

The Flex-Ring closure offers many advantages over flange closures. Some of these are: less time in opening and closing (only one bolt to operate); less weight; fewer parts; tighter seal; and greater safety.

These closures consist of four main parts; weld neck, plug, gasket, and spider. The flexible metal gasket is held in compression between the plug and weld neck. The gasket is flexed to an elliptical shape to allow it to pass through the plug opening. Once in place, tightening the spider nut causes the gasket to return to a round shape for proper seating position. *Sillers Engineering Co.*

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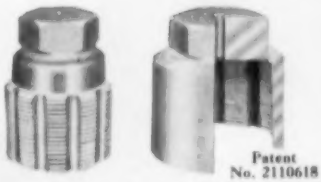
TUBING
Cleanout
TAP *and* **DIES**
by Baird



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For field use in cleaning up smashed threads, removal of dirt and contamination on collar or tubing. The tap end is relieved at each land to assist in removal of gyp.

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PRODUCTION PUMPING

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GAS ENGINE

• Nordberg *POWER CHIEF* Gas Engines are low cost, medium speed units, ruggedly built for production pumping jobs where 'round-the-clock performance is a must.

Available as straight power units, rated 18 hp max., with stub shaft or clutch power take-off . . . and as "packaged" generator sets producing up to 10 kw, Nordberg *POWER CHIEF* Gas Engines are simple to install and easy to maintain—always ready to efficiently serve you 24 hours a day.

And remember . . . these compact units are backed by the same reputation for dependability as the larger Nordberg Diesel, Gas and Duafuel® Engines used across the nation for pipe line pumping. Clip coupon for copy of Bulletin 231.
Nordberg Mfg. Co., Milwaukee, Wisconsin

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NORDBERG
Builders of America's Largest Line of Heavy Duty Diesels

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Please send full details on the new Nordberg *POWER CHIEF* Gas Engines.
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- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Jack Manual. The 40-page, illustrated manual is in color. It explains how to choose the right jack for the job; lists the types of ratchet, screw, and hydraulic jacks in from 3 to 100-ton capacities; and gives complete specifications for each jack. The manual also explains in detail how to use, care for, and maintain jacks. *Duff-Norton Manufacturing Co.*

Check No. 12 On The Time Saver Card

•

Chemical Procelain Equipment. A new 24-page bulletin describes a line of chemical porcelain equipment for process applications. The usefulness of porcelain as a material of construction is described with specifications on its chemical and physical nature. Equipment cataloged and described includes Y and angle valves, safety valves, plug cocks, pipe and fittings, towers, tower plates and nozzles, and raschig rings. Two pages describe the new Tufclad armoring available for all porcelain equipment. Alternate valve packings are cataloged with special emphasis on solid Teflon wedge ring packings now available for all Y and angle valves. Four pages of the bulletin are devoted to installation and operating recommendations. *Lapp Insulator Co., Inc.*

Check No. 13 On The Time Saver Card

•

New Self-Operated Flow Regulator Catalog. A new self-contained flow-regulating device for clean gas-free liquids is described and illustrated in Catalog No. 10-F-70. A constant flow rate is maintained by means of energy derived from the flow stream itself, without external power supply. The regulator is unaffected by position and may be equipped with a diaphragm motor valve for remote setting of control point. *Fischer & Porter Co.*

Check No. 14 On The Time Saver Card

•

Welding Design Manual. A new, fully illustrated, 14-page pocket-size manual contains detailed instructions on joint design with many drawings showing the

NORDBERG ENGINES
help set new efficiency standards on SHELL PRODUCTS PIPE LINE

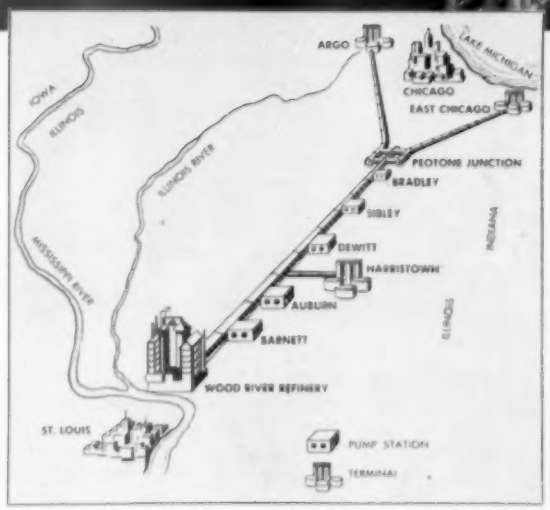
INCORPORATING the most modern concepts of products pipe line and station design, Shell Oil Company's new 14" Wood River carrier has been referred to as a "*Pipe Line of the Future*".

Helping to establish new standards of efficiency and safety on this line are two new Nordberg four-cycle supercharged Diesel engines with eight cylinders of 13" bore and 16½" stroke, each rated 1210 hp at 460 rpm, driving a centrifugal pump with a capacity of 4160 barrels per hour through speed increasing gears.

One of the many unique features of this new line is the automatic starting and operating system for the control of the pumping units, which adds speed and flexibility of operation, with a minimum of personal attention.

Modern pipe line pumping operations like this can be successful only when the power job is assigned to reliable, heavy duty prime movers. That's why more and more pipe line operators are installing Nordberg Engines . . . in sizes up to 4260 hp.

Write for further information outlining your power requirements.



The new 14" Shell line runs 279 miles between the Wood River refinery and terminals at Argo, Illinois and East Chicago, Indiana—replacing an old 8" line. 1210 hp Nordberg Supercharged Diesels are installed in stations at Auburn and Sibley, Ill.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

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for PEAK PERFORMANCE

Engineers and designers of industrial and commercial buildings know galvanized sheets to be superior building material for this type of construction—particularly for roofing and siding. They know that time-tested galvanized sheets offer:

- **SHORT-TERM *plus* LONG-TERM ECONOMY**
  Low *initial* cost, low *application* cost, low *per-year* cost
- **STRENGTH OF STEEL; RUST-PROTECTION OF ZINC**
  Withstand rough treatment, add structural strength and are fireproof

All galvanized sheets give years of useful service. But the *heavier* the zinc coating, the *longer* the life of the base sheet. Because various weights of zinc coating look alike on the surface, it pays to *specify a grade-marked sheet* . . . Get the heaviest coating you can buy!

ZINC INSTITUTE 2 OZ. COATING SEAL OF QUALITY

IT'S THE ZINC THAT STOPS THE RUST

For long, rust-free service, specify a heavy duty sheet such as the "Seal of Quality" with a zinc coating of *2 ounces per square foot.* For heavier coatings order according to ASTM Specification A 93.

ATTENTION: MAINTENANCE DEPTS.

Get the facts on MZP (Metallic Zinc Paint) for structural steel and galvanized surfaces. Also, zinc for cathodic protection and grounding electrodes. Check coupon below.

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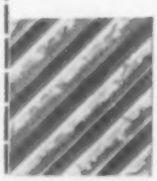


difference between good and bad design. It shows the types of joints possible, their names, and when and why they should be used on a given operation. A section is devoted to overlaying and hard-surfacing. The best joint designs are shown for welding steel and the recommended torch rods or electrodes. *Eutectic Welding Alloys Corp.*

Check No. 15 On The Time Saver Card

●

PF-100 Dual Vane Hydraulic Pumps. Bulletin DP-302 is illustrated with cutaway drawings showing detailed construction features and performance data. Design of new pumps allows approximately twice the horsepower in the same space or the same horsepower in half the space. Pumps in the PF-100 series have capacities of 3, 5, 8, and 11 g.p.m., rated at 1,200 r.p.m. These pumps can be operated continuously at pressures to 2,000 psi., and can be supplied for either flange or base mounting. *Dudco Division, New York Air Brake Co.*

Check No. 16 On The Time Saver Card

●

New Plunger Pump Bulletin. A new Bulletin No. W414-B45 on vertical triplex, single-action plunger pumps is graphically illustrated by photos, charts, and line drawings. The bulletin contains information about features, applications, ratings, dimensions, and specifications of the VTE, VTE-1, and VTE-2 types. Designed for application in many fields including the petroleum industry, water-flooding, salt water disposal, hydraulic-descaling system, the plunger pumps offer such features as interchangeable plunger sizes; individual valve covers; flanged suction and discharge openings; stuffing-box drains; complete automatic oiling system; straight-through liquid flow; close-clearance liquid end; and synchronous suction valve unloaders. *Worthington Corp.*

Check No. 17 On The Time Saver Card

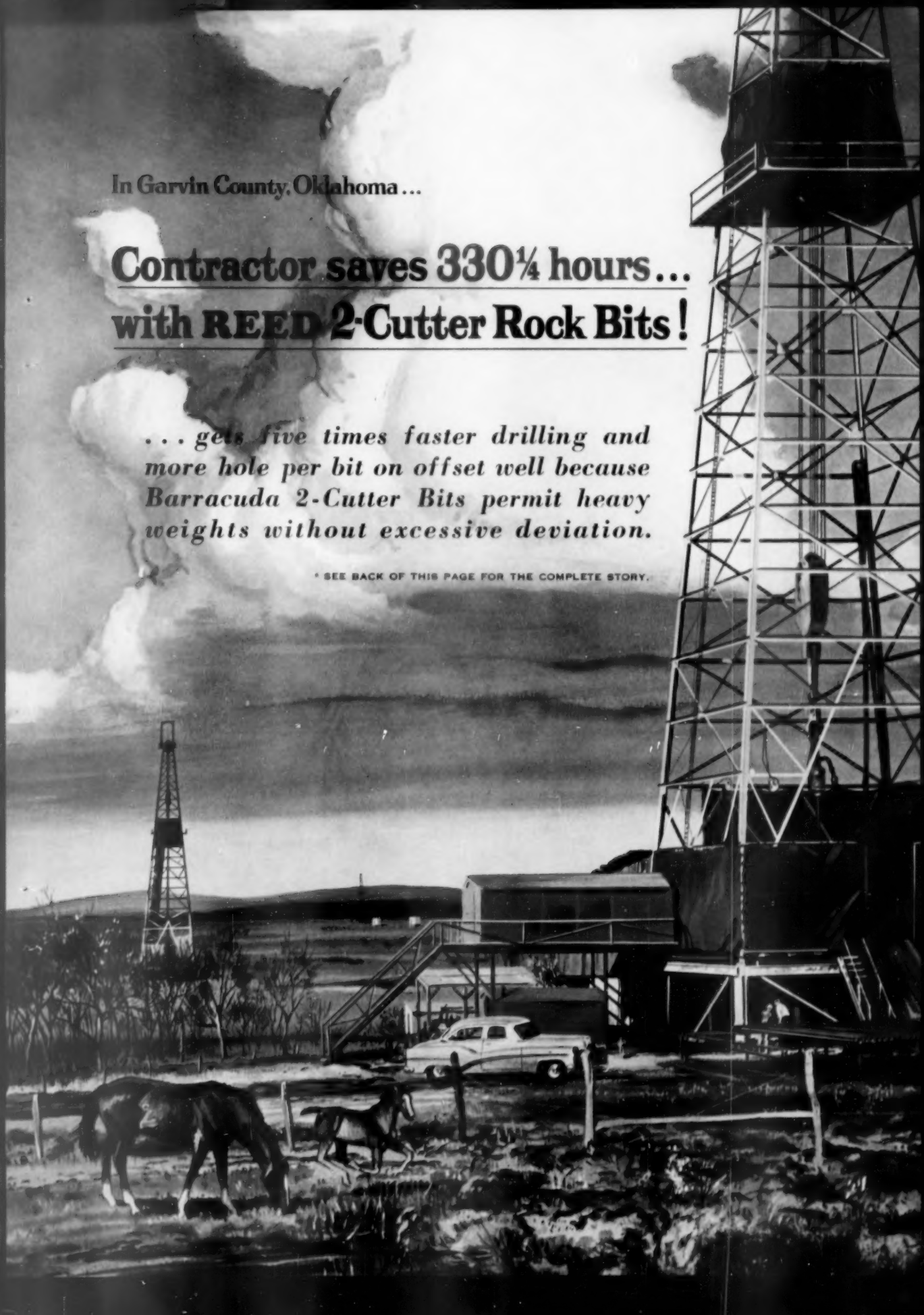
●

Custom Engineered Equipment for Refineries and Chemical Plants. Bulletin E-1, a 12-page brochure perforated for loose-leaf binding, pictures specially fabricated fractionating, stabilizer and reactor towers, water scrubbers, heat transfer equipment, cracking units, chillers, filter tanks, and forged-steel valves. *Henry Vogt Machine Co., Inc.*

Check No. 18 On The Time Saver Card

●

Water Conditioning Data Book. A new edition of the pocket-size Data Book No. 2478A presents a compilation of 78 chapters and tables, all valuable to


In Garvin County, Oklahoma...
Contractor saves 330¼ hours...
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...gets five times faster drilling and more hole per bit on offset well because Barracuda 2-Cutter Bits permit heavy weights without excessive deviation.
* SEE BACK OF THIS PAGE FOR THE COMPLETE STORY.

REED Barracuda 2-Cutter ROCK BITS

DEPTH OF HOLE	FOOTAGE EACH BIT	HOURS BIT RUN	WT. ON BIT IN 1000 LBS	DEVIATION
8798				1½°
8889	91	13	35	¾°
8940	51	5	40	¾°
9017	77	9	40/60	2°
9171	154	16½	35	1¾°
9252	81	10	40/60	2¾°
9301	49	9	35	2½°
9339	38	6¼	35	2½°
9382	43	10	35	1¾°
9393	11	2½	25	1¾°
TOTAL	595 feet	81¼ hours		

CONVENTIONAL BITS

DEPTH OF HOLE	FOOTAGE EACH BIT	HOURS BIT RUN	WT. ON BIT IN 1000 LBS	DEVIATION
8765				7°
8832	67	29	10	8°
8900	68	31	10	8°
9047	147	45	10	8°
9144	97	43		
9174	30	37		
9200	26	26		
9276	76	48		
9303	27	32		
9325	22	22		
9337	12	16½		
9350	13	24		
9378	28	36		
9401	23	22		
TOTAL	636 feet	411½ hours		

Contractor saves 330¼ hours... with REED 2-Cutter Rock Bits!

THE TRIGG DRILLING COMPANY, drilling two offset wells in Garvin County, Oklahoma, for a major oil company, made competitive runs between 8700 and 9400 feet.

On one well they used conventional bits and on the other they used the new **REED** Barracuda Twin-Blast 2-Cutter Bits.

Formations were Springer Shale, Base Springer, Caney Top and Woodford. Both rigs had 7¾ x 18 pumps with 6½" liners, and both used 9" bits.

Here's what happened:

On the well using conventional bits, drilling weights were about 10,000 pounds and deviations reached 8 degrees. Rate of penetration averaged only 1.54 feet per hour and 13 bits were used to drill 636 feet.

With **REED** *Barracuda Bits, weights of from 35,000 to 60,000 pounds were used and deviations never exceeded 2¾ degrees. Rate of penetration averaged 7.32 feet per hour (a record for this field) and only 9 bits were used to drill 595 feet.* This contractor saved 330¼ hours drilling time, the cost of four rock bits, and four round trips. Excerpts from the bit records, shown in the tables above, give the story in detail.

This is an outstanding example of the benefits that result from running **REED** Twin-Blast Rock Bits and following the suggestions of your **REED** representative as to drilling weight, pump volume and rotary speed.

REED ROLLER BIT COMPANY

HOUSTON, TEXAS

4775 A

the engineer. Subjects covered include: hydraulics, impurities in water, chemical conversions, coagulant, acid and alkali dosages, chemicals used in water treatment, water treatment processes, boiler feed makeup requirements, alkalinity relationships, specific gravities, chemical reactions, and hydraulic conversion factors. *The Permutit Co.*

Check No. 19 On The Time Saver Card

●

Velocity Stage Turbines. A four-page illustrated bulletin describes velocity-stage Class CA turbines. The CA turbine for mechanical drive operates under all inlet steam conditions up to 600 psig. and 750° F. Modified construction allows maximum inlet temperature of 825° F. Maximum speed is 4,000 r.p.m. with the shaft governor. Speeds are increased up to 6,000 r.p.m. with vertical or hydraulic governors. Design features, which are shown on a large cutaway drawing, include centerline support and flexible front-end mounting for radial and axial expansion. *De Laval Steam Turbine Co.*

Check No. 20 On The Time Saver Card

●

Heat-Resistant and Corrosion-Resistant Alloy Castings in Industry. Bulletin A-141 discusses typical compositions regularly produced, with their applications, limitations, and the types of service for which they are suitable. Over 175 photographs illustrate applications of typical alloys by industry. Charts compare creep strength of various alloys, resistance to corrosion in certain media, and to oxidation at elevated temperatures. *International Nickel Co.*

Check No. 21 On The Time Saver Card

●

New Sensitized Products Booklet. A new booklet, featuring the Post sensitized products line, serves as a practical guide to the selection and purchase of reproduction materials and supplies. It includes comprehensive listing of dry-developed print-making papers, reproduction cloths and films, semi-moist direct-process papers, blue-print papers and cloths, sepiatone negative and brown-line papers, and contact-type washoff process reproduction cloth and paper, and related developer chemicals, eradicators, and miscellaneous supplies. *Frederick Post Co.*

Check No. 22 On The Time Saver Card

●

Leakproof, Quick-Seal Hose Coupling. A quick connect-disconnect hose coupling for water, oil, steam, gas, and

PAGE FENCE - Since 1883

• AMERICA'S FIRST WIRE FENCE •

• Page Chain Link Fence, pioneered by Page and made only by Page, is quality controlled from raw metal to erected fence. Whether you choose heavily-galvanized Copper Bearing Steel, or long-lasting Stainless Steel, or corrosion-resisting Aluminum, you'll have a rugged fence on sturdy metal posts deep-set in concrete. Choose any one of 8 basic styles, varied by heights, types of gates, posts, top rails and barbed wire strands for extra protection. And to be sure of reliable workmanship your fence will be expertly erected by a specially trained firm. For helpful Page data and name of member nearest you . . .

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, New York or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

EXCEL-SO CALIBRATING TANKS

Send for Bulletin CT-102-53

For use in accurately calibrating positive displacement meters at refineries, terminals, pipe lines, loading racks, tank trucks and public sealers.

A calibrating tank, or meter prover, is essential in keeping your meters accurate. Small meter errors can be very costly. Here is a precision instrument which will quickly pay for itself. Designed to conform with the A.P.I. Code #1101 Excel-So Calibrating Tanks come in sizes from 50 gallons to 2000 gallons in both stationary and portable styles.

WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

Division of FRAM CORPORATION

"THE BRAND OF PROGRESS"

By Heat Exchanger Specialists

▲ SYNOPSIS OF AD #5: The purchasing department of Western Supply is charged with keeping the delicate balance between warehouse stocks of plate, tubes, channels, and flanges . . . and special materials requisitioned from outside sources. This balance is essential if maximum heat exchanger economy is to be achieved. The skill of Western's purchasers is proven in securing the high priced materials involved in alloy fabrication. Dollars saved through this experience are happily passed on to Western's customers.

sixth in a new series of advertisements

FIGHTING HEAT EXCHANGER CORROSION

. . . . With Experience in Special Metal Fabrication

Refining and chemical processing as we know them today have been made economically feasible by the development of heat transfer equipment.

Originally, heat exchanger design problems were simple but higher temperatures and pressures, combined with corrosive fluids have complicated the problem.

Today the experienced metallurgist and the trained welder form an indispensible team in Western Supply Company's heat exchanger plant. Corrosion and pitting may be controlled at the initial fabrication point through the skillful selection and fabrication of special metals.

Western has exerted great care in the initial selection and subsequent building of its technical staff. In addition it has equipped this staff with the latest welding and stress-relieving equipment. Western's experience in alloy fabrication dates back many years and includes working in such metals as . . . AISI Stainless Steels in the 300 series . . . High Chrome Irons . . . the Refiner's Alloys, the low chrome Moly Steels . . . Monel . . . Copper Silicon . . . Copper . . . Nickel.

For heat exchanger on corrosive stream . . . consult with Western Supply Company.

WESTERN HEAT EXCHANGERS

WESTERN SUPPLY CO.

P. O. BOX 1888 • TULSA, OKLAHOMA

chemical lines, which provides permanent freedom from leakage, is described in this new bulletin. The 16-page booklet describes the simple construction of the coupling. Also described in the bulletin are single and double-check valve modifications of this coupling which permit disconnecting lines without shutting down pumps and prevent escape of valuable or hazardous fluids when lines are opened. Coupling accessories, such as right-angle connections and dirt-exclusion covers are also described. *Titeflex, Inc.*

Check No. 23 On The Time Saver Card

●

Governors for Diesel Engines. Publication 401, an eight-page booklet describes servo-operated devices for controlling diesel-engine speeds in engine applications where exacting speed control is required. The use of light components in the centrifugal mechanisms ensures a rapid response accompanied by adequate governor power and improved stability. *Ardleigh Engineering, Ltd.*

Check No. 24 On The Time Saver Card

●

Westinghouse Equipment for Pipelines presents a full line of equipment for pipeline operation. Equipment described includes electric motors, combustion gas turbines, gear units, power transformers, substations, distribution equipment, switchgear and controls, supervisory control, microwave, ventilation equipment and lighting. Illustrations of actual installations on operating pipelines are utilized. *Westinghouse Electric Corp.*

Check No. 25 On The Time Saver Card

●

Pipeline Compressor and Pump-Station Radiographic Weld Standards. These standards, prepared by W. W. Thayer, are based on 7 years' experience with pipeline welding. Subject matter covers welding defects and evaluation of X-ray photos. *Thayer X-Ray Service.*

Check No. 26 On The Time Saver Card

●

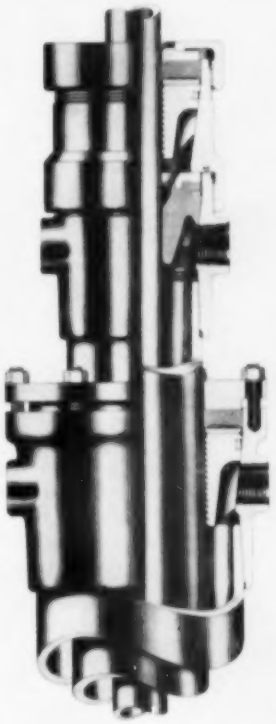
Waterfrac Increases Well Capacity covers the problem of converting a water-supply well into a water-disposal well. Waterfrac, a new fracturing service employing thickened water and sand, was used to open up the formation. Other applications include producing gas wells, gas-injection wells, salt-water-disposal wells, water-injection wells, and fresh-water-supply wells. *Dowell Incorporated.*

Check No. 27 On The Time Saver Card

RECTOR TYPE "R"

Low Pressure, Low Price, FORGED STEEL CASING and TUBING HEADS

GIVE YOU MAXIMUM VALUE IN EVERY RESPECT



• **Designed for pressures up to 2,000 lbs., Type "R" Casing and Tubing Heads have many features and advantages that make them outstanding values in heads of this type. Extremely adaptable, they are ideally suited for the widest possible range of producing conditions. Ask your Rector Representative or SUPPLY STORE about Type "R" Casing and Tubing Heads for your low-pressure wells, or to replace high-pressure tubing head and tree when changing from flowing to pumping conditions.**

SEAL

Both casing and tubing heads have an oil-resistant pack-off which is forced into sealing position by a split packing gland. Casing Head gland is tightened down by 6 stud bolts . . . Tubing Head gland by a cap threaded to the body.

SUSPENSION

Casing Head has case-hardened, three-segment type HINGED slips of ribbed construction to allow full flow to outlets. Tubing Heads employ same type of suspension or special threaded type or slip-type mandrel hanger for use with Kobe pump.

SIDE OUTLETS

Both Casing and Tubing Heads are available with 2", 2½" or 3" threaded side outlets.

BOTTOM CONNECTIONS - SIZES

Casing Heads have male or female threaded bottom connection sizes 8⅝" through 13⅜". Tubing Heads available with male or female threaded bottom, 5½" through 7", also all flange sizes and series, with standard API ring groove and bolting arrangement.

STRIPPER

When desired, a slip bowl adaptor carrying slips, packing and gland can be attached to the threaded top of tubing head body. Strippers and slips are interchangeable.

For complete description and illustrations of various assemblies, see pages 4230-34 of 1954-55 Composite Catalog.

RECTOR WELL EQUIPMENT COMPANY INC

MAKING THE OIL INDUSTRY SAFER

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Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTORSEAL

EQUIPMENT MEN . . . in the News

Garrett Announces Key Changes in Sales Staff

D. E. Whittenberg, of Houston, and Harold L. Brown, of Dallas, have been elected vice presidents of Garrett Oil Tools, Inc., Longview, Tex., and have also been appointed managers of sales in two recently created company sales regions.

Whittenberg, formerly manager of the company's Southwest Texas division, was placed in charge of the South-

WHITTENBERG

H. L. BROWN

ern Region encompassing the territories from New Orleans to the Rio Grande in Texas. This region includes the oil-producing areas commonly referred to

B. F. KRAUSE

V. B. SCOTT

as South Louisiana, Texas Gulf Coast, and Southwest Texas.

Brown is manager of the Northern Region which includes East Texas, North Texas, West Texas, North Louisiana, Arkansas, and Oklahoma. He was formerly manager of the East Texas and West Texas divisions.

B. F. Krause, former manager of the Texas Gulf Coast division, was made manager of the company's export division, and also placed in charge of the areas where Garrett products are distributed through independent sales agencies. Krause will also serve as technical coordinator between the sales and engineering departments.

Vernon B. Scott, formerly manager of the distribution agency for Garrett relief valves, was named manager of the relief valve division of the company.

In making the announcements, H. U. Garrett, president of Garrett Oil Tools, Inc., said that they were a part of a broad company policy aimed at closer coordination between manufacturer and ultimate consumer. A new executive sales office and warehouse, now under construction in Houston, is also included in this program.

Halliburton is Observing Its Thirtieth Anniversary

The thirtieth anniversary of Halliburton Oil Well Cementing Co., was observed July 1 at the company's Duncan, Okla., headquarters. Fifteen men received specially engraved 30-year watches from Erle P. Halliburton, founder and chairman of the company.

Some 7,500 home-office employes and their families attended a company-sponsored barbecue and circus on July 1. The annual stockholders' meeting was also held that day.

The Halliburton company was incorporated on July 1, 1924 and had 56 employes. Today, over 7,000 men and women are employed in 23 states and 13 foreign countries.

Swiss Detroit Diesel Manager Visits U. S.

Gine Casserini, manager, Detroit Diesel Engine Division, General Motors Corp., in Switzerland, has been in the United States for the past few weeks making a tour of oil fields in Kansas, Oklahoma, and Texas.

Arch Campbell, Tulsa, manager of petroleum sales for Detroit Diesel, has accompanied Casserini on his oil-field travels. Casserini, who is making his first visit to the United States, covers oil fields in northern Italy and in Sicily.

Farmer Joins Welex Jet In Administrative Post

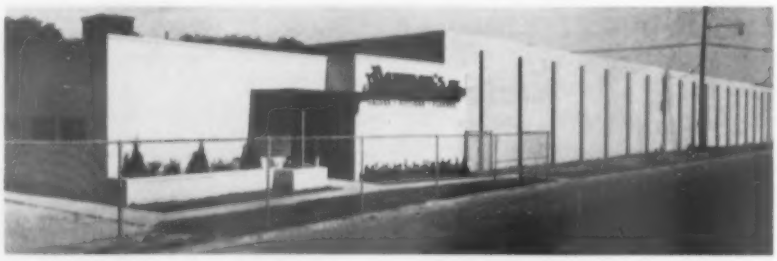
Joseph W. Farmer has been named sales administrative assistant in charge of advertising and public relations for Welex Jet Services, Inc. He will work in the company's Fort Worth general office. Farmer was formerly a partner in a commercial publishing company, where he was advertising manager and publications director. He worked for the Fort Worth Press as a reporter and was oil and state editor of the Denton (Tex.) Record-Chronicle.

Watts Represents Conoflow In Southeastern Texas

The Watts Co., Houston, has been appointed as exclusive sales representatives for Cono controls in southeastern Texas and southwest Louisiana for Conoflow Corp., according to John C. Koch, vice president in charge of sales.

Ralph L. Watts, principal of the organization, worked in the drilling department of Taylor Refining Co., Alice, Tex., for a period and then became associated with Duriron Co., Dayton, Ohio. He served as manager of Duriron's Philadelphia branch for 3 years. He resigned from Duriron Co. to become vice president of Small Parts Manufacturers Co., in which capacity he remained until his return to Texas to form The Watts Co.

Conoflow Corp. is a manufacturer of pneumatic final control elements.



Newman's, Inc. Opens General Office, Warehouse

Newman's, Inc., of Tulsa, recently opened a new $100,000-general office and warehouse. The new building, adjacent to an old warehouse building with 25,000 sq. ft. of space, includes 10,000 sq. ft. of new warehouse space and 2,000 sq. ft. of modern office space. Valves, flanges, and fittings are distributed by Newman's throughout the United States and Canada.

J. & L. Opens Stores in Kentucky and Wyoming

Jones & Laughlin Steel Corp., Supply Division has opened two new stores. One of these was opened on June 1 in Paintsville, Ky., and is under the supervision of H. E. Wagner, district sales manager of the eastern district. Paul Somerville will manage this store. He was transferred to Paintsville from Pineville, W. Va. H. C. Goodwin, who has been associated with the company at another point, is moving to Paintsville as a salesman.

The other store was opened in Worland, Wyo., on June 15. This store will be under the supervision of M. A. Park, district sales manager of the company's North Rocky Mountain district. B. J. Gough will manage the store at Worland. He was transferred from Kermit, Tex. J. R. Robinson, who has been associated with the company at Longview, Tex., has moved to Worland in the capacity of a salesman.

Elmore Made Assistant Manager, Machinery Sales

R. E. ELMORE

R. E. Elmore has been promoted to assistant manager of machinery sales at the Fort Worth general offices of Mid-Continent Supply, according to Ken W. Davis, president. Elmore was promoted from the oil-field supply company's Houston division, where he served as division machinery manager.

Elmore, with over 17 years' service to Mid-Continent, joined the company at Kermit, Tex., in 1917. Since then, he has worked in Seagraves, Fort Worth, Houston, and Dallas, Tex.; Houma and New Orleans, La., and from 1945 until 1951 at the Mid-Continent New York export office where he was export manager.

Dresser Industries Sells Kobe, Inc.

Dresser Industries, Inc., one of the country's leading manufacturers of oil, gas, and chemical equipment, has announced the sale of one of its operating units, Kobe, Inc., Division of Dresser Equipment Co., Huntington Park, Calif., according to a statement by H. N. Mallon, president.

Kobe manufactures and distributes hydraulic oil-well pumping equipment and, according to Mallon, has been successful and enjoys a well-established position in the oil industry. Mallon pointed out, however, that Kobe's activities are specialized and that its sales and earnings represented only a minor portion of Dresser's combined operations.

The principals in the purchase were a group of investors headed by C. J. Coberly, inventor of the Kobe aydraulic-pumping process and founder of the company.

Osgood-General Names Williamson To Key Post

WILLIAMSON

Kenneth O. Williamson has been named sales manager handling excavators and materials-handling equipment for Osgood-General, Marion, Ohio, according to Robert C. Owens, president. Williamson, formerly assistant sales manager, succeeds James S. Fortiner, who has resigned.

Williamson has a wide experience in both the manufacture and sale of Osgood-General machines. He became associated with the company during 1941 in the production department. Before his appointment as assistant sales manager in 1950, he had served as division sales manager in several territories.

Owens also advises that consolidation of General Excavator Co. with Osgood Co., announced earlier this year, has now been completed with the transfer of all production facilities to the Osgood plant.

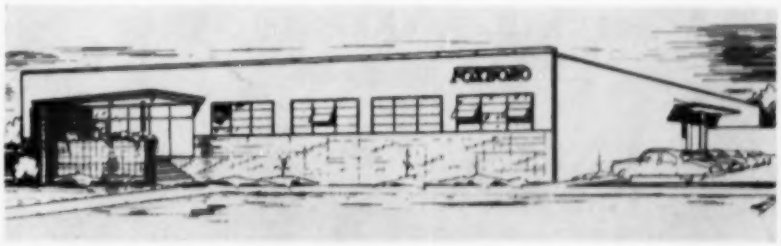
Crain Joins McEvoy as Sales, Service Engineer

Tom Crain has joined McEvoy Co. as sales and service engineer in the New Orleans and Mississippi River Delta areas. Crain has had 25 years' experience in the oil industry in the Mid-Continent and Gulf Coast areas. Before joining McEvoy he worked 12 years in New Orleans and Harvey, La., areas with associated companies in the oil industry.

H. L. Cunningham Joins Glenn Mason Agency

H. L. (Bob) Cunningham, veteran advertising executive in the heavy industry field, has joined Glenn Mason Advertising, of Shreveport, as vice president and account executive. Prior to joining the Mason firm, Cunningham was advertising manager and technical service representative for Ideco Division of Dresser Industries, in Dallas. He had held that position since 1948. Before joining Ideco, he was a member of Arnold & Cheezem Advertising Agency, Oklahoma City, specializing in oil and gas equipment and heavy industry accounts.

Foxboro Officially Opens Dallas Branch Factory

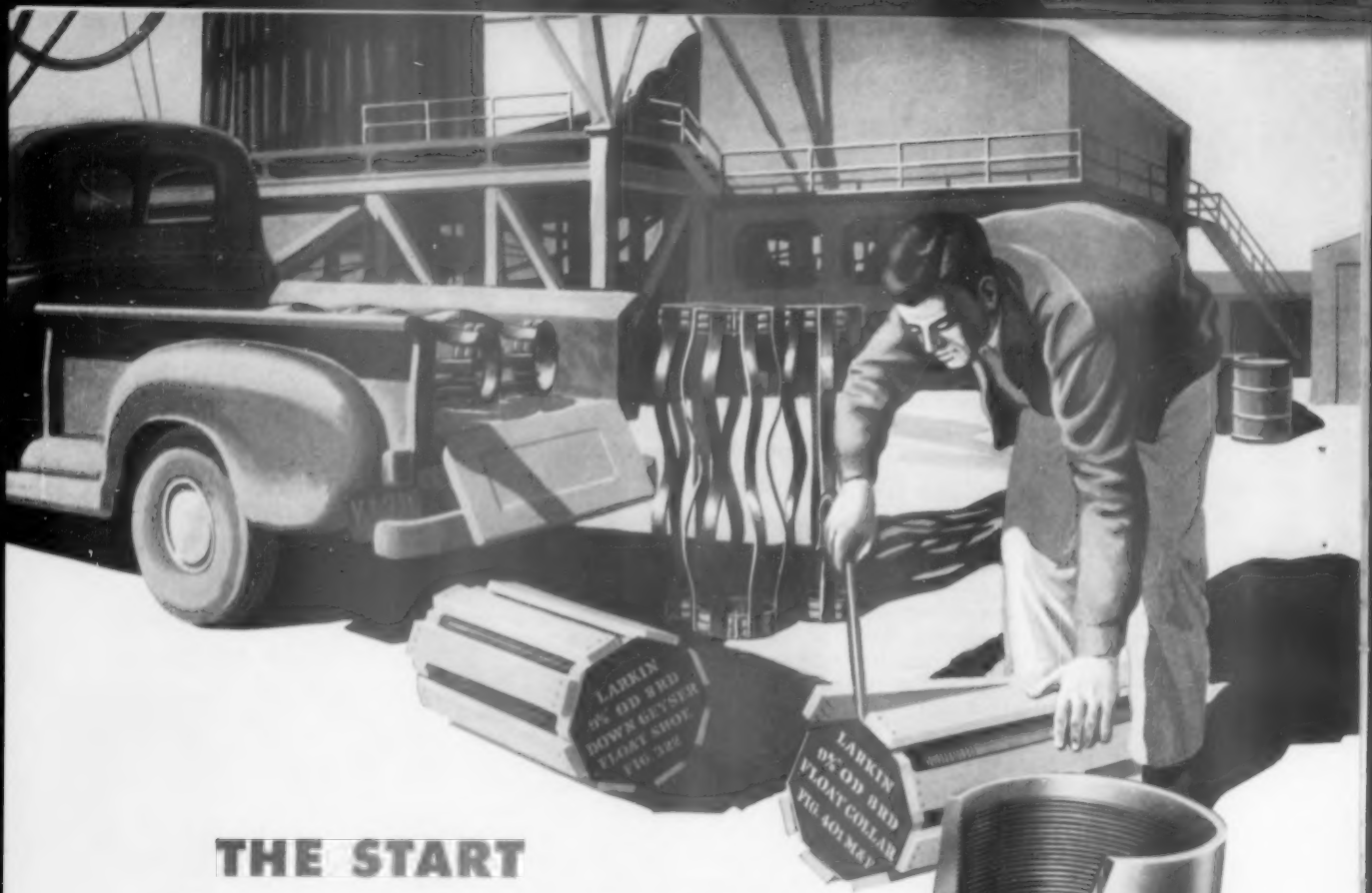


Architect's sketch of new branch factory erected in Dallas by The Foxboro Co.

Official opening of the recently completed Dallas branch factory of The Foxboro Co., Foxboro, Mass., was attended by customers, company officials, and friends in May. The new 13,000-sq. ft. building is the first of three key factories to be constructed by Foxboro this year. Others are being built in San Leandro, Calif., and Pittsburgh.

Divided into assembly and repair sections, the factory is equipped to manufacture such instruments as flow meters, recording pressure gages, and pneumatic controllers. Assembled instruments are stocked in a warehouse section, as are instrument parts, accessories, and control-valve components.

Describing the new facilities during



THE START
of a good cement job

The evenly distributed flow of cement—provided by the annular discharge of the Larkin Geyser Shoe—around casing positively centered by Larkin Lok-On Centralizers is your best assurance of a well-started cement job.

These thoroughly proved products are available everywhere—". . . Through Your Supply Store."

LARKIN PACKER CO., INC.

St. Louis, Mo.

Larkin Lok-On Centralizers

Larkin Float Collar Fig. 401 M&F

Larkin Float Shoe, Regular, Fig. 302

LARKIN

...Through Your Supply Store

the plant inspection were E. L. Stark, Dallas district manager; J. J. Burnett, manager of Foxboro's Central division; and R. A. Bristol, treasurer of the company.

Ball Named Vice President Johnston Testers, Inc.

L. C. BALL

Louis C. Ball has been named vice president and assistant to the president of Johnston Testers, Inc., it was announced recently by M. O. Johnston, president of the firm. Ball joined the firm June 1. He was formerly regional manager of Rheem Manufacturing Co., whose southern regional office is located in Houston. Before joining Rheem, Ball was for 6 years associated with Henry J. Kaiser, of Oakland, Calif. While with Kaiser, he participated in the exploration for aluminum ore in South America and the Carribean area. He also worked with the administrative offices of Kaiser Gypsum Co., heading investigations for the building materials firm.

Fluid Packed Pump Co. Increases Sales Force

Sidney Shuman, executive vice president of Fluid Packed Pump Co., has announced promotions and additions to the sales force in keeping with the company's expansion and its enlarged service program.

D. A. Vandenburg has been appointed manager of the newly created Southwest division. The consolidated territory includes West Texas, New Mexico, North Texas, East Texas, North Louisiana, and Arkansas. Vandenburg will be assisted by Bill Bonner, Jr., who has been appointed manager of the West Texas and New Mexico district. Woodrow Satterwhite is managing the East Texas, Shreveport district, which serves North Louisiana and Arkansas. Ledford Smith is managing the North Texas and Panhandle district.

Jack Clements, formerly of Casper, Wyo., has been transferred to Calgary, Alta., and has been made division manager in charge of all Canadian operations.

M. W. Curtis has been appointed Northwest division manager with headquarters at Casper.

The following men have been transferred: Ray Green from Duncan, Okla., to El Dorado, Kans.; Roy Fitts from Seminole to Duncan, Okla. Additions to the sales force include: Ray Brown, Kermit, Tex.; Orville Zickefoose, Snyder, Tex.; Holger Hanson, New Iberia, La.; Curtis Green, Seminole, Okla.; Jack Upchurch, Fairfield, Ill.; and Hugh Newcomb, Grayville, Ill.

Wyckoff Promoted to Mid-Continent Area Post

G. I. WYCKOFF

Promotion of Gerritt I. Wyckoff, district engineer at Tulsa for U. S. Steel's Oil Well Supply Division, to manager of production equipment sales for Oilwell's Mid-Continent area has been announced by Mark Barkhurst, area manager. Wyckoff, who has just completed 20 years' service with Oilwell, the past 8½ as district engineer here, will continue to headquarter in Tulsa.

Wyckoff joined Oilwell in June 1934 as a student engineer in training at the division's Imperial Works, Oil City, Pa.

L-P GAS TESTING EQUIPMENT

Tests . . .

• PROPANE • BUTANE • OTHER LIQUIFIED PETROLEUM GASES

VAPOR PRESSURE BOMB

Designed for NGAA Standard No. 2140 requirements. Used for the determination of the gauge vapor pressure of liquified petroleum gas products. This apparatus consists of a bomb having two sections, or chambers. An upper 80% capacity chamber and a lower 20% capacity chamber. A bleeder valve, inlet valve, and chamber separating valve are included. Bomb and gauge connections use soft rubber gaskets permitting hand tight seals. Each bomb tested to 500 psi. Range 0-300 lbs.

CORROSION TEST BOMB

Tests the corrosiveness of LP gases. An all stainless steel bomb for corrosion tests by the copper strip method. Sealed by a neoprene "O" ring which makes it possible to make the bomb pressure tight with the hands and without wrenches. Complete with two nickel plated valves, connecting hose with swivel connections, adapter to ¼-inch pipe.

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CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO
SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA

He entered the sales organization at Casper, Wyo., the following year, and in 1937 was named Oilwell's representative at Maracaibo, Venezuela. He became district engineer at Wichita, Kans., in 1941, holding that position until he transferred to Tulsa in 1946 as district engineer for the Mid-Continent area.

Floridin Moves Offices To Tallahassee, Fla.

Floridin Co., fullers earth, activated bauxite, and commercial adsorbent manufacturer, has announced the establishment of new executive and administrative offices at Tallahassee, Fla. Floridin has, for the past 43 years, maintained headquarters at Warren, Pa., where a branch sales office will now be maintained. Floridin Co. products have increased from the original oil refining adsorbent use to a multiplicity of products covering the diversified field of adsorption.

The new general office building at Tallahassee was completed several weeks ago, and administrative activities are currently being handled at that location.

A new research and development laboratory, currently under construction at the same location, will be ready for occupancy in a few weeks.

The move of the administration offices and research and development laboratory is designed to result in a closer coordination between all branches of the company. The Floridin Co. has fullers earth plants at Quincy and Jamieson, Fla., and an activated bauxite plant at Sweet Home, Ark., and a synthetic adsorbent processing unit at Clarendon, Pa.

H. K. Porter Acquires Pioneer Rubber Mills, Inc.

H. K. Porter Co., Inc., Pittsburgh, Pa., has announced acquisition of Pioneer Rubber Mills, Inc., Pittsburgh, Calif., manufacturer of industrial rubber products on the Pacific Coast. The announcement was made by Porter's president, T. M. Evans, who stated that the new acquisition would become part of Quaker Rubber Corp., one of H. K. Porter's nine divisions. The Pioneer plant becomes the fifteenth factory in the Porter group.

Pioneer Rubber Mills, founded in 1888, has its factory in Pittsburgh, Calif., and its general offices in San Francisco. Pioneer manufactures rubber belting, hose, packing, and many other industrial rubber products similar to those manufactured by Quaker on the Atlantic Coast.

Quaker's main offices and plant are located in Philadelphia. Pioneer will retain its identity. Sumner M. Suhr, sales manager, who has been with Pioneer since 1917, has been appointed manager of the new division under George A. Dauphinais, vice president and general manager of Quaker Rubber Corp.

Los Angeles Nomads Induct Two New Members

Being inducted as regular members at the June 9th meeting of Los Angeles Chapter of Nomads are Art Marshall, H. C. Smith Oil Tools Co. (center left), and Lee Nave, Alexson Manufacturing Co. (center right). To the left is Ox Morgan, Falcon Products, Inc., sergeant-at-arms, and to the right is Joe Schlerb, Chiksan Company, vice president.

GLITSCH
LARGE...
OR SMALL . . .
TRAYS
Simple and adaptable in design, GLITSCH "Truss-Type" lightweight trays can be designed for any process requirement with respect to tray size, process layout, type of flow, type and shape of downcomer, weirs, wells, and size and shape bubble caps as well as suitable corrosion resistant materials.
GLITSCH BUBBLE CAPS
Dies for 287 different cap and riser assemblies are now available. The cap styles can be varied further by a wide range of slots. Holddown styles simplify clean-outs, reduce "off-stream" time to a minimum.
Glitsch
FRITZ W. GLITSCH & SONS, INC.
P. O. Box 6227
DALLAS 2, TEXAS
Your engineering staff can effect definite savings in initial designing by utilizing GLITSCH world-wide experience in plans, design and fabrication of tower internals. Cost analyses are available promptly.
SALES OFFICES: New York • Chicago • Cleveland • Houston • Tulsa • Los Angeles

Wilgus Manufacturing is A Division of N.G.E.

Announcement of the final consolidation of Wilgus Manufacturing Co., pioneer Los Angeles manufacturer of gas and oil regulators, into an operating manufacturing division and wholly owned subsidiary of Natural Gas Equipment, Inc., has been made by J. V. Thomas, N.G.E. president.

Details of the complete integration of Wilgus manufacturing machinery and personnel into N.G.E.'s new and larger quarters at Pasadena, Calif., have been given by R. L. Grutzmacher, executive vice president of N.G.E. Almost 60,000 sq. ft. of floor space is now occupied by N.G.E. in order to accommodate Wilgus machinery and the increased number of workers required by the design, manufacturing, assembly, and sale of the extensive line of N.G.E. gas burners and industrial furnaces.

Warren McKenna Joins Hill & Christopher Agency

Formerly advertising and sales manager for several Los Angeles industrial firms, Warren P. McKenna recently joined Hill & Christopher advertising agency in Los Angeles. McKenna majored in electrical engineering at M.I.T., studied chemical engineering at Brown University, and advertising and marketing at Face Institute.

During the past 15 years, McKenna has had advertising and sales experience in the petroleum, aircraft, hydraulics, chemical processing, and mining industries. He will serve on the plans board and as account executive for several Hill & Christopher clients.

Clark Promoted to New Post By G-E Communications

R. G. Clark has been appointed as district sales manager for communication products in South Central Texas, according to a recent announcement by General Electric Co. Clark will headquarter in San Antonio, Tex., in his new position which has been created to more adequately serve the growing South Texas area, including the Rio Grande Valley.

The appointment was made by L. Robert Sheeley, manager of sales for G-E communication products, a unit of the company's commercial equipment department at Electronics Park in Syracuse, N. Y.

Since joining the company in 1952, Clark has served as communications specialist with the New Orleans office.

Mike Pennock Heads Anchor Truck Sales

G. M. PENNOCK

G. M. (Mike) Pennock, Jr., has been named manager of the truck sales division of Anchor Petroleum Co.'s home office in Tulsa, according to W. A. (Bill) Baden, president. Pennock's new duties entail the supervising of truck sales in all district offices, as well as the home office, and management of trucking operations in a nine-state area. Customer contacts and plant operations are also controlled from Pennock's office. Prior to his new appointment, Pennock was assigned to the tank car and general sales division of Anchor. He joined the petroleum firm in November 1950, after leaving Barnsdall Oil Co., of Tulsa.

One Inert-Gas-Filled Motor Replaces Eight at Refinery

R. W. Mills, utilities engineer in the general engineering division of The Standard Oil Co. (Ohio), and General Electric sales engineer, C. A. Schroeder, examine the 7,700-lb. rotor for what is believed to be the world's most powerful inert-gas-filled motor. Now under construction at the G-E Schenectady, N. Y., plant, the 3,500-hp. electrical giant will drive a new centrifugal gas compressor, and will replace eight reciprocating engines used in connection with the catalytic cracking process at Sohio's No. 1 refinery, Cleveland. It is expected to eliminate excessive building vibration, reduce maintenance, increase production, and improve safety conditions.

Kaiser Steel Names Emerson As General Sales Manager

C. Lee Emerson has been named general sales manager for Kaiser Steel Corp., it has been announced by C. F. Borden, vice president in charge of sales.

Prior to his new appointment, Emerson was southern district sales manager with headquarters in Los Angeles. In his new capacity he will be located in the general sales office, Oakland, Calif.

He joined Kaiser in 1942 as materials engineer at the Richmond shipyards. In 1945 he joined Kaiser Steel in the sales department.

U. S. Stoneware Co. Opens Houston Office

STANLEY CRAIG

Howard Farkas, vice president and general sales manager of U. S. Stoneware Co., Akron, Ohio, has announced the opening of a direct factory sales office in Houston to broaden its range of service to the Southwest. Stanley Craig, for several years assistant sales manager of U. S. Stoneware in its home office, will be in charge of the new offices in Houston. Craig has had a broad background of experience in the solution of corrosion problems.

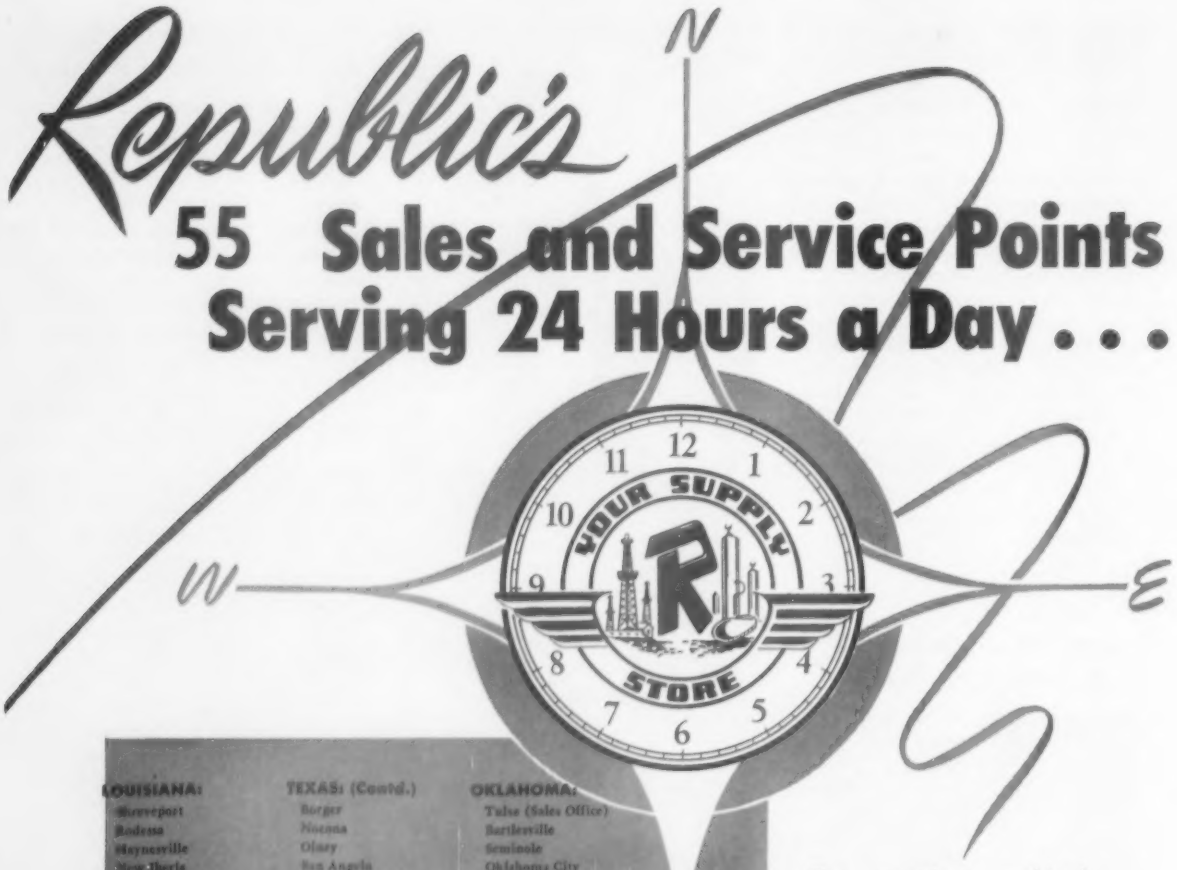
Hick's Names Distributors For Shur-Kure Additive

Hick's Rubber Co., Fort Worth, has announced seven new warehouses where large stocks of Shur-Kure ground rubber tires for lost circulation in oil-well drilling will be available to the oil industry. The new distributors are: Tri-State Engineering & Service Co., Houston; Tri-State Engineering & Service Co., Victoria, Tex.; McColm & Spence, Odessa, Tex.; Nichols Tool Co., Borger, Tex.; Drill Prodco, Hobbs, N. M.; Tri-State Engineering & Service, Scott, La.; and Leidecker Tool Co., Edmonton, Alta., Canada.

Shur-Kure ground rubber tires contain various size particles of nylon, rayon, cotton, and synthetic and crude rubber, are low in cost, and packed in all-weather bags that are easy to handle, store, and mix. Shur-Kure has no adverse effects to mud, and is not harmful to product by action of pumps, guns, and bit jets.

Republic's

55 Sales and Service Points Serving 24 Hours a Day . . .



LOUISIANA:
Shreveport
Bodcau
Haynesville
New Iberia
Lake Charles
Marvey
Monroe

ARKANSAS:
El Dorado

TEXAS:
Kilgore
Corpus Christi
San Antonio (Sales Office)
McAllen
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Alice
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Ranger
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TEXAS: (Contd.)
Borger
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Olney
San Angelo
Rule
Whitesboro
Dallas (Sales Office)
Fort Worth (Sales Office)
Odessa
Lubbock (Sales Office)
Midland (Sales Office)
Big Spring
Sundown
Kermit
Snyder

NEW MEXICO:
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WYOMING:
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The convenient, combined services of 44 completely stocked field "warehouses," and 11 centrally located sales offices, are at your disposal every hour of every day, and at every point of the compass!

The modern, REPUBLIC SUPPLY STORES, always alert to your requirements, have maintained an enviable record of forty-three years of dependable service . . . your guarantee of immediate, proper delivery, and your assurance of getting what you need, when and where you need it!

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EXPLORATION

Cardium Strikes Indicate Vast Reserves

by Frank J. Gardner

CALL it Cardium, or call it Bighorn —either term will evoke a broad smile of happy anticipation from any Alberta oil man today. For not only has the Cardium (or Bighorn) at Pembina yielded to Canada the greatest oil field in its history, but recent strikes to the south of Pembina indicate that Cardium reserves may surpass any estimates yet made for the new oil sand.

Pembina opens first pool . . . Prior to 1953, the Cardium had never been seriously considered as an oil reservoir. A couple of wells in western Alberta, in the foothills area, had had Cardium shows of gas, but no thought had been given to its oil potential until Socony-Vacuum Oil Co. of Canada, Ltd., opened Pembina field on July 1, 1953. Today, of course, hindsight observations are rife in Alberta. . . "We should have known," moaned one geologist, "that if it outcropped in the foothills and disappeared in the syncline, a subsurface pinchout occurred somewhere to the east."

Socony-Vacuum had the foresight, however, to instruct its crews to watch for the Cardium sand when its Pembina discovery well was spudded in February 1953. The wildcat's objectives in the Mississippian and Devonian were based, though, on a seismic picture in those beds; the Cardium was nothing more than a stratigraphic stepchild along the way. On the way down, the operation logged an oil show in the sand at 5,350 ft., and after the deep horizons proved to be dry, the shallower Cardium was retested and final completion was effected for 144 bbl. per day of good 37° crude.

Outposts Lend Significance

The most sensational stepout well for the new area was Shell Oil Co.'s well No. 2 at Peers (see map), a "stratigraphic test" that went to 7,305 ft., plugged back to 6,892 ft., and was "unofficially completed" in February 1954 as a Cardium oiler at 6,080 ft. Immediately, draftsmen drew encircling field boundaries linking the Peers strike with the main Pembina field area 39 miles to the southeast, and oil circles

SUCCESSIVE OIL STRIKES in the Cardium sand of southwestern Alberta indicate major oil reserves surpassing all present estimates.

everywhere were intrigued by talk of the "world's biggest field," "greatest pool in America," and similar superlatives.

But Peers didn't live up to its promise; offset wells to the south of it were dry, and the "discovery well" itself has not survived as a good Cardium producer. There was a furious erasing of boundaries on Canadian maps as it became apparent that outlining the field wasn't going to be so easy, and hesitant hands sketched in a "preliminary shaleout" line.

More significant were Stanolind Oil & Gas Co.'s outpost wells to the west of Pembina; that company's Crown wells C-1, D-1, and E-1 extended the field 10 to 12 miles westward to firmly establish it as Canada's largest field, and reservoir data indicate that the extensions are indeed in a common pool with the heart of the field.

Recent strikes point southward . . . The disappointments to the north, however, must not be interpreted as dampers to the Cardium promise. Conversely, the recent strikes south of the main field point to possibilities even greater than the promise of Peers. Twenty-four miles due south of Pembina, New Superior Oils of Canada, Ltd., et al. is still conducting production tests at its 10-27 Rocky Mountain House, in Township 42, Range 8 (see map), after the well showed for a Cardium producer. Tests indicate now that it may not pan out as a flowing well, but it has forged another link in the eastern arc of Cardium pinchout.

A giant stride 48 miles southeast of the Rocky Mountain House well, and nearly 75 miles southeast of Pembina's heart, New Superior et al. 11-7 Garrington has brought flush Cardium production within 65 miles of Calgary. Here, the sand at 6,902-80 ft. has yielded flows of 39.8° crude in amounts approaching a barrel per minute. The well is located in LSD 11, 7-35-4w5 (see map) and is still running production tests. Topping the Cardium sand zone at 6,889 (—3,254) ft., it has run 1,500 ft. lower than the Pembina discovery well and has found no water.

Future unknown, unlimited . . . The Cardium hunting ground, then, appears to be almost unlimited in southwestern Alberta. Generally, the trend stretches between Calgary on the southeast and Edson on the northwest, an airline distance of about 200 miles. Within the trend, we are confronted with the fact that oil has been produced from the sand at two points (Peers and Garrington) 136 miles apart, and that east-west definition hasn't even been considered. Curiously enough, nobody has even intimated that Rocky Mountain House and Pembina proper might constitute a common pool, although the intervening distance is 15 miles less than between Peers and Pembina. A far greater stretch of the imagination would be required to suggest that Pembina and Garrington are connected, for whoever heard of an oil field 100 miles long with a net porous sand varying from zero at its eastern edge to a possible 80 ft. or more at its western limit?

Six Seismic Crews Seek Another Pollard

Alabama exploration focused on state's fault-line trend

by Dr. Walter B. Jones

DISCOVERY of Pollard field in early 1952 touched off an active exploration campaign in southwestern Alabama. Currently there are six seismic crews working in the state, most of them concentrated along the fault-line trend, attempting to locate another Pollard or Gilbertown.

Alabama's three oil fields form a very definite trend across southwest Alabama, in a northwest-southeast direction. Perhaps it is not at all an oddity that the Hatchetigbee anticline and Jackson fault, two of the best known structures in the southeast, occupy the same area. Naturally exploration is concentrated along this trend.

Geology

Outcropping at the surface in the oil belt are beds of Eocene age. Subsurface beds include Lower Cretaceous, Smackover, Eagle Mills, and others which do not show on outcrops in the state. The Hatchetigbee anticline extends across the south-central part of Choctaw County, from the Mississippi line to the flood-plain deposits of the Tombigbee River. On the eastern side of the river, in the southern part of Clarke County, the Jackson fault winds southeastward and finally southward, to lose itself along the Tombigbee, just above the cutoff.

Irregularities in the normal south dip of the strata in Choctaw and Clarke counties was first noted by Prof. Michael Tuomey and reported by him in 1850.[1] The structures were carefully studied in 1883-84 by Smith and Langdon.[2] In 1917 O. B. Hopkins[3] published a detailed account of both structures. Hopkins' interpretation of the structures has not been materially modified by later observers.

Structural features . . . The Hatchetigbee anticline has an axial trend of S. 55° E. The "closed" area, or that part completely encircled by outcrops, is 35 miles long and 8 to 10 miles wide. The entire length of the structure is about 50 miles. The southwest flank is the steeper (1° to 2°) and the northeast flank is gentle (1° or less). The anticline is completely surrounded by the Tallahatta formation which forms a pronounced escarpment overlooking the lower area underlain by the stratigraphically lower Hatchetigbee formation. High spots on the anticline appear, from surface indications, to be near Bladon Springs and Salitpa.

Author is state geologist and oil and gas supervisor of Alabama. Paper presented before Interstate Oil Compact Commission, Savannah, Ga., May 14, 1954.

THE FAULT-LINE TREND of southwestern Alabama has accounted for three oil fields with proved reserves of 10 million barrels. At present, 115 oil wells are on production.

The Jackson fault was first thought to be an eroded anticline but later definitely established as a fault. Undoubtedly it is connected with the Hatchetigbee anticline at the Tombigbee River. Evidence of the fault zone can be seen along Stave Creek, 4 miles north of Jackson. At that locality the Tallahatta Buhrstone dips 1° to 2° northeast. West of this point the Marianna limestone outcrops, indicating a throw of about 300 ft. Farther west at Salt Mountain, the throw increases to about 500 ft. The dip on the upthrow side is 1° to 2° away from the fault (east), and the dip on the west side is 7° to 9 into the fault. A series of salt springs (Upper, Central and Lower) indicates that the fault extends to a considerable depth.

There is surface evidence of other faults in the general area of the above structures. On the inside (southeast) of the crescent is a deep salt basin, with steep shore lines along the fringe. On the outside, the basin is probably more shallow, with correspondingly more gentle shore lines.

The origin of the structures is thought to be a differential settling of unconsolidated beds on a deep seated mass or ridge of hard rocks below.

Some minor structures show up in adjacent parts of Monroe and Baldwin counties and across the waist of Escambia County.

Exploration

The first well on the Hatchetigbee anticline was drilled by Captain Trowbridge, of Cullom Springs, in 1884. Carried to a depth of 1,345 ft., the well probably ended in the Ripley formation, of Upper Cretaceous age. The Bollinger and Mitchell tests were put down in 1917-18, to depths of 4,015 and 3,400 ft., respectively, each thought to terminate in the Tuscaloosa formation, at the base of the Upper Cretaceous. The 1 McCorquodale followed in 1923-24, to a depth of 3,695 ft., also ending in the Tuscaloosa. All of these prospects were drilled along the crest of the anticline, with reports of small shows of oil or gas or both, and salt water.

Several wells were drilled in the vicinity of the salt springs along the Jackson fault, in 1902-04, following the discovery of the Spindletop pool, on the theory that salt springs indicated salt domes—and oil. All were dry holes.

During the last 15 years, geologists have swarmed over the area trying to solve the riddle. Scarcely a section of a fence line, or a limb has not been decorated by paper streamers by geophysical crews at one time or another, in a search for clues to the subsurface alignments. Core-drill crews checked indicated structures here and there. It has been and still is tough going. The secrets are well hidden. The general conditions are favorable, with prominent surface structures and ample thicknesses of porous sands at depth.

Development

Gilbertown field . . . Alabama's first commercial oil well, the 1 A. R. Jackson, was brought in on February 17, 1944, (by Hunt Oil Co., in Gilbertown

field, just 60 years after Captain Trowbridge's effort at Cullom Springs. Instead of being discovered on top of the anticline, oil was found against a fault zone on the northern flank.

The first well was a producer and is still one of the best in the field. The Jackson well was completed in fractured zones in the Selma chalk of Upper Cretaceous age. Since the discovery, 75 wells have been completed as producers, of which 67 are still in operation. Most of the wells produce from the Eutaw sands which underlie the Selma. Depths range from 2,502 to 3,572 ft. In the field area 34 prospects have been dry. Some drilling continues on units within the productive area, with moderate success. Stepouts and wildcats in the general region have been unsuccessful. The field extends from the Mississippi line to within 3 miles of the Tombigbee River, in an east-west direction. The productive zone is narrow, mostly one to two units wide, with a few barren spots where intersecting faults interrupted the flow of oil.

The gravity of the oil in the Gilbertown field is 19° A.P.I. corrected, and is asphalt base. Allowable in the field is 100 bbl. per day. Only a few wells in the eastern part of the field actually make the allowable. It is a water-drive field, with all wells making some salt water and many making 90 per cent or more. A very few wells make enough gas to operate the separators. Porosity in the Eutaw sands is about 35 per cent. Permeability ranges from 100 to 178 md.

Near the middle of the eastern section of the field, Carter Oil Co. drilled its 1 James to a depth of 13,283 ft. to test deeper sands. After many mechanical difficulties, the project was abandoned, with reported gas show at 9,640-75 ft. It ended up in the Buckner formation of Jurassic age.

South Carlton field . . . Discovery well in this field was Humble Oil & Refining Co.'s 1 J. H. Wall, completed on May 6, 1950. Producing horizon is the glauconitic sands of the lower Tuscaloosa formation at 5,417-29 ft. Initial tests were about 100 bbl. per day of 14°-gravity oil, asphaltic base. Since discovery, nine wells have been completed in Clarke County, and one just across the Alabama River in northern Baldwin County. This is also a water-drive field and all wells make more or less salt water. All produce from the same horizon. The discovery well was the first one in the area.

The structure is an anticline, well off the outer rim of the Jackson fault, with a north-south axis. Its limits are yet to be determined, but it is thought to be four or five locations wide in the middle. The field is located in a deep swamp and all locations must be made on ramps built 15 ft. above the swamp floor. This greatly increases the cost of operation which, with the low-gravity oil, makes the proposition not too attractive.

"The industry in Alabama is young and healthy . . . great areas await exploration with average chances of success."

One stepout well to the west, and two to the north, were dry. Although a road has been extended from Carlton to the developed area, the oil is being shipped out by barge. Before the road was completed, the entire project was serviced by water transportation.

In 1952 a deep test was sunk near the middle of the structure to try for deeper production. Carried to a depth of 15,729 ft. in salt in the Buckner formation of Jurassic age, it encountered no other attractive horizons, and was completed as a producer in the lower Tuscaloosa. The well encountered other shows, but none would produce. Presently development is at a standstill. The operation is a costly one.

Pollard field . . . On January 19, 1952, Humble again hit pay in its 1 A. W. Moye, also in the lower Tuscaloosa formation. The saturated sand was 27 ft. thick, with top at 5,945 ft. Production string was perforated from 5,945-49 ft. After completion, the well produced at the rate of 340 bbl. per day through 3/16-in. choke. Shut-in pressure was 2,600 psi., while open pressure was 2,175 psi. There was no basic sediment or salt water. Gas-oil ratio was 45 to 1. Gravity ranges from 25° along the outside to 30° near the inside. Since discovery, two other sands have been developed in the low Tuscaloosa, with one in the lower Wilcox (Eocene) as a possibility. In all, 37 wells have been completed as producers, 2 of which have been abandoned. To date, 10 stepouts and fringe projects have been dry holes. About 20 failures have been drilled within 10 miles of the productive area.

The structure is a fault zone less than 3 miles long, with northwest-southeast trend. Saddles at each end permitted the oil to escape from the trap. Where it came to rest is strictly the $64 question!

Allowable in the field is 100 bbl. per day. Many of the wells are making the allowable, with the fringe wells making less oil and varying amounts of salt water. Most of the wells along or near the fault flow, while the others are on pump. Development in the field is almost complete, with Humble, Gulf Refining, and Stanolind Oil & Gas companies controlling production acreage.

The discovery came as no surprise, for Stanolind almost had a producer late in 1951, when it barely missed a completion in the same horizon a little more than a mile to the southwest of the 1 Moye. The actual discovery was the second well drilled in that vicinity.

In the early days of the field, jockeying for leases was frenzied. One lease sold for a bonus of $300 per acre, believed to be a high for Alabama.

The structure was found by geophysics and checked by core drill. Other similar structures exist in the Monroe, Escambia, Clarke, and Conecuh counties. Some have been tested, with negative results so far. Exploration is expected to continue and the reward should be well worth the effort.

Production . . . In 1952, Alabama's 110 wells produced 1,687,982 bbl. of oil and in 1953 the total was 1,705,000 bbl. At the moment 115 oil wells are producing with proved reserves estimated at 10,000,000 bbl.

Conservation laws . . . Alabama's oil industry operates under excellent laws and rules and regulations. Basic laws were passed by the legislature in 1939, 5 years before production. In 1945, with the able assistance of the Interstate Oil Compact Commission, men of the oil industry and of state governments, complete laws were embodied in the Johnston-Redd Act and passed by the legislature without a dissenting vote. The laws have not been amended since passage.

Conclusions

The industry in Alabama is young and healthy. There are great areas awaiting exploration with average chances for success. Most landowners are willing to lease, and rentals are generally low. Every reasonable cooperation is extended to each legitimate operator.

References

1. First Biennial Report, Geological Survey of Alabama, p. 150, 1850.
2. Coastal Plain Report, Special Report 6, Geological Survey of Alabama, p. 211, 1894.
3. U. S. Geological Survey, Bulletin 661, 1917.

The Flight of Elmer Quillback

You've all heard the story of Paul Revere
and his famous ride at night
But listen, my friends, and you shall hear
of another famous flight.

Elmer Quillback drove a pick-up truck
for United Supply—no less!
He worked very hard to earn every buck
and make himself a success.

He drove supplies to oil field rigs
to keep them makin' hole—
it took a lot of thingamajigs
to keep them under control.

One night his big chance came
just as he was quittin' work
A Judson county rig was lame
the engine wouldn't perk.

You can count on me, said Elmer,
to deliver the parts, I'm proud
to serve United's customer—

I'LL BRAVE YON THUNDER CLOUD!''

They loaded the parts in nothin' flat
and Elmer began to roll—
on safety he always stood pat
as he sped toward his goal.

It was a night that really wasn't fit
for man or even beast—
and when the big storm really hit
Elmer just kept headin' East.

He knew United's slogan well
"You can rely on United Supply"
to look at his face you could tell
that to him it was do or die.

Suddenly his truck took off the ground
up into a funnel-shaped cloud.
The roar of the wind made a terrible sound
and Elmer sang out loud.

"Off we go into the wild blue yonder"
His voice rang clear and true
But his mind would never wander
from the job he had to do.

Now his truck began to descend
and Elmer saw his final goal
He knew he'd be a godsend
to the drillers waitin' at the hole.

As he touched the ground he heard a cheer
from the drillers shouting for joy.
"The supplies are already here—
they'll really be proud of this boy!

Now we know that the service is keen
that you get from United Supply
But Elmer Quillback proved what they mean

that THEIR TRUCKS COME ON THE FLY!

YOU CAN RELY ON UNITED SUPPLY!
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COURTESY • SERVICE • DEPENDABILITY

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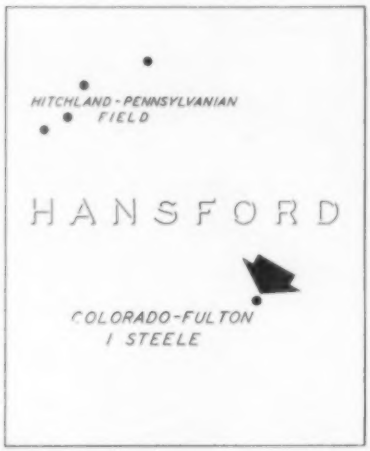
COURTESY • SERVICE • DEPENDABILITY

HUGOTON EMBAYMENT

Third Pay Tested at Panhandle Gas Strike

A third pay zone is assured in northeastern Hansford County's new gas field at Colorado Oil & Gas Co. and R. H. Fulton 1 Steele, 12 miles north of Spearman and 6 miles southeast of Hitchland Pennsylvanian field (arrowed on map).



The wildcat flowed 6,500 M.c.f. of gas per day, then decreasing to 3,980 M.c.f., from perforations at 5,256-78 ft. in the Tonkawa. The discovery already has assured production in the Cherokee and Oswego. It flowed 3,140 M.c.f. from the Cherokee natural from perforations at 6,633-42 ft.; it flowed 900 M.c.f. of gas per day after treatment from perforations in the Oswego at 6,051-66 ft.

Atoka discovery . . . R. H. Fulton 1 Jackson, 5 miles northwest of Spearman, and ¾ mile west of the 1 Matthews Morrow gas discovery, is testing as an Atoka strike.

The discovery flowed 1,289 M.c.f. of gas per day from perforations at 6,904-13 and 6,917-27 ft. It then flowed an estimated 10,000 to 12,000 M.c.f. of gas per day following perforations at 6,952-78 ft.

Potential Due at Clark County Kansas Strike

Potential is awaited at Delhi Oil Corp. 1 Gross, SW SE NW 34-34s-25w, 3 miles north of the Oklahoma line in Clark County, Kansas.

The well is shut in as a Mississippian gas well after flowing at the rate of 7,500 M.c.f. per day.

Harper's Ranch extension . . . Pure Oil Co. 1 Harper gaged on final test 846 bbl. of oil per day on bomb-test potential. Production is from the Morrow sand. It is a ¾-mile east extension to the field.

Second Cherokee Well Finaled at Northwest Eva

The second producer from the Cherokee (Pennsylvanian) sand in Northwest Eva field, Texas County, Oklahoma, has been completed by United Carbon Co., Inc., at 5 Kelley, NW NE 11-4n-10eCM. It offsets the recent strike made by Gulf Oil Corp. at 1 Hixon.

The well made potential flow of 285 bbl. of oil daily through ¼-in. choke. Elsewhere in the field the 6 Kelley will be completed dually in the Cherokee and Morrow as a gas well. The well flowed 16,750 M.c.f. of gas per day natural.

Morrow Gas Discovery Seen in Ochiltree

The Texas Co. 1 Pearson Daniel "A," southwestern Ochiltree County, is an assured Morrow gas discovery 9 miles south of Waka. It is 9 miles southeast and northwest of single Pennsylvanian wells.

The well flowed 4,830 M.c.f. of gas per day following fracture.

Texas Panhandle Geological Wildcat is Discovery

On the southern flank of the granite ridge which separates the Panhandle into two basins, Cabot Carbon Co. 1 Baker is a Permian brown dolomite gas strike.

The well, 3 miles northwest of Alanreed and 1 mile southeast of nearest production, flowed 5,000 M.c.f. of gas per day.

New Extension Strike in Southeast Camrick Field

United Producing Co. 1 Harrison, NW SE 25-2n-19eCM, 1 mile north outpost to Southeast Camrick field's recent northeast extension, flowed gas at the rate of 6,500 M.c.f. per day from the Morrow sand (B on map).

The 2 Harrison has been staked across the county line in Beaver County in the NE NE SW 30-2n-20eCM (C on map). It is a 1-mile east outpost.

American Gas Producing Co. has a 1-mile west extension to west flank production in the Camrick area at 1-A Squires, SW SW NE 17-1n-19eCM (D on map). It flowed 5,020 M.c.f. of gas per day from the Morrow sand.

Beaver County . . . J. M. Huber Corp. 1 Zielke, NW NE 28-6n-21eCM (A on map), has indicated Morrow oil production in Light field, the first oil discovery in the area. It swabbed 20 bbl. of oil in 5 hours, then 10 bbl. in 6 hours after acid treatment. It is about 2 miles southwest of nearest production.

KANSAS

New Gas Discovery Reported North of Rhodes Pool

Musgrove Petroleum Co. has a Douglas sand and Mississippian gas discovery in Barber County, 1¼ miles north of Rhodes pool and 3 miles northeast of Gerlane.

The 1 Early, SE SE SW 4-33s-11w, gaged 5,408 M.c.f. of gas per day on drill-stem test in the Douglas sand and Tonganoxie at 3,703-35 ft. A test in the Mississippian at 4,414-50 ft. gaged 2,190 M.c.f. of gas per day. Recovery was 130 ft. of gas-cut mud.

APPALACHIAN AREA

OHIO

Two additional gassers extended new North Royalton pool in Royalton Township, Cuyahoga County. H. A. Dempsey et al 1 J. Dendorfer, Section 15, found a pay of 950,000 cu. ft. natural in the Oriskany sand logged at 1,787-1,842 ft. The same operator missed the Oriskany pay in their 1 R. Taplishay, Section 15, and drilled to the Clinton at 3,101-3,103 ft., finding a pay of 250,000 cu. ft. natural.

Mutual Oil and Gas 1-C K. R. Boyd, Section 4, Perry Township, Licking County, opens up additional drilling area adjacent to an old pool. Clinton sand at 2,916-2,982 ft. made 5 bbl. natural and 139 bbl. in a 24-hour test after fracturing. In the southeast corner of the same Township, the S. H. Everett Co. 3 Frank Westbrook, Lot 1, made 450,000 cu. ft. gas and 514 bbl. oil in a 24-hour test after fracturing. Clinton sand was logged at 3,006-3,067 ft.

PENNSYLVANIA

In Plumcreek Township, Armstrong County, Southwest Pennsylvania, C. E. Louden, has drilled 1 Mae Harkleroad, to the Bradford sand at a depth of 3,845 ft., with a small flow of gas which has been turned into the pipe line. A deep hole drilling rig is being moved in and financial arrangements are under way to now drill as a deep rank wildcat to the Oriskany sand which is expected to be reached at a depth of approximately 8,200 ft. This well is on the Elders Ridge Quadrangle .34 mile south of latitude 40 degrees 45 minutes and .72 mile west of longitude 79 degrees 20 minutes and 2.75 miles east of the town of Whitesburg. Monroe Township, Bedford County, John Galey 1 Donald H. Miller drilling at 3,758 ft. Salt Lick Township, Fayette County, Mid Atlantic Oil & Gas Co. 1 Adolph Dupre, drilling 950 ft. Cherry Hill Township, Indiana County, Chestnut Ridge Oil & Gas Co. 3 Ralph White, drilling 6,522 ft., and in Pine Township, T. W. Phillips Gas & Oil Co. 7 Fee, announced the Tully Lime 7,358-7,360 ft., with drilling at 7,905 ft. Gaskill Township, Jefferson County, Fairman Drilling Co. 1 Clair Reed, is at 1,157 ft. Derry Township, Westmoreland County, Mid East Oil & Gas Co. 1 Frank Litvik, is drilling 6,100 ft.

WEST VIRGINIA

Glade district, Webster County, West Virginia, Gregory Gas Co., completed 1 T. C. McElwain, wildcat, elevation 2,250 ft., gaging 3,921,000 cu. ft., gas, Maxon sand 1,419 ft., gas 1,435-1,494 ft., TD 1,494 ft. In Valley district, Barbour County, and Roaring Creek district, Randolph County, Cumberland & Allegheny Gas Co. announced location of 1-514 Luvena M. & Roy Talbott wildcat. It

is several miles to the north of the drilling now under way in this area and if successful it will cause further drilling activity.

TEXAS

WEST TEXAS

New Ellenburger Oil for Crockett County

Humble Oil & Refining Co. 1-H Fee, Section 57, Block UV, GC&SF Survey, has been completed as an Ellenburger discovery, flowing 1,220 bbl. of oil in 17 hours. Pay section was perforated between 6,930-50 ft. and tubing choke was 18/64-in.

The new well is approximately 1 mile east of Pennsylvanian Strawn production in Todd field, which also has a large Ellenburger producing sector. Flowing pressures were not reported on final test, but on a previous test through ½-in. choke, the well flowed 179 bbl. of oil and 11½ bbl. of water in 16 hours, under tubing pressure of 525 psi. Tentative top on the Ellenburger was 6,935 ft. on elevation of 2,666 ft.

Humble's well found the Ellenburger deeper than wells in the Todd-Ellenburger field, but apparently is on a separate structure. A contour map of that field shows the Ellenburger gently dipping on the west flank, but dipping abruptly on the east. It is also shown to be severely eroded on the east flank and production has been defined on that boundary.

New pay in East Tippett . . . Third and highest pay in the Wolfcamp conglomerate has been indicated at Bankline and Hurt 1-42 Tippett, 42-31-H&TC. Location is a southwest offset to the East Tippett field opener, and both wells are on the southeast end of Tippett field.

Operators drilled into the conglomerate at 5,847 ft. A drill-stem test at 5,849-60 ft. had gas in 21 minutes, mud and oil in 105 minutes. Recovery was 3,255 ft. of oil-cut mud, plus 2,430 ft. of salt water. Later, a test between 5,876-5,907 ft. had gas in 2 minutes, and mud in 5 minutes, followed by gas and distillate. Gas volume was estimated at 5,000,000 cu. ft. daily. Recovery in the pipe was 4,500 ft. of distillate, plus 5 ft. of fresh water. Pipe was run to 6,097 ft. to test regular pay sections productive in the field, and in the new discovery.

Vaughn-Ellenburger pool . . . This area had its third well assured at Sinclair Oil & Gas Co. 3 Holt, 63-OP-GC&SF Survey, which is a ¾-mile northeast extension.

Drill-stem test in the Ellenburger from 7,603-23 ft. had gas in 3 minutes and recovered 6,400 ft. of 40° oil. Other sections to yield oil on tests were from 7,623-73 and 7,673-7,723 ft. The latter section had flowing oil which tanked 8½ bbl. in 1 hour.

Northwest of Elkhorn-Ellenburger field, Humble 1-AB University, wildcat in 12-51-University Land Survey, prepared to complete after testing oil in the Ellenburger from 9,515-40 ft. Recovery was 275 ft. of oil and gas-cut mud. The well unloaded an estimated 8 bbl. of oil following a test from 9,215-9,304 ft., identified as in the Hunton limestone.

Midland County . . . A new pay in the Warren field and new locations on the Dora Roberts Ranch featured the week's developments in this new area.

On the north side of Warren field, Warren Petroleum Corp. 2-G TXL flowed oil from the Fusselman section. Sample top on the Fusselman was 12,500 ft. and the section tested was from 12,485-12,635 ft. Gas surfaced in 10 minutes and oil in 1 hour and 15 minutes. After cleaning into pits, the well flowed 13½ bbl. of oil in 1 hour and 15 minutes. The well is an Ellenburger test and will be drilled ahead. Location is a northwest offset to the same operator's 1-G TXL, which made a 615-bbl. Pennsylvanian well, and ¾-mile north of Cities Service and Forest 1-C Roberts 4, Ellenburger discovery.

Forest and Cities Service have made location for two additional tests on Dora Roberts Ranch land. The 1-C-1 Roberts was staked in NE NE of Section 22, and is a southwest offset to Cities Service 1 Parks, Ellenburger discovery. Forest and Cities Service 1 Fee "15" was spotted in SW SE of Section 15, which is ½ mile west of 1 Parks.

NORTH TEXAS

Grayson County Fields Have New Pay Discoveries

Standard Oil Co. of Texas 2 Stout, 2 miles northwest of Sherman, has assured production from Oil Creek sand, a new and deeper horizon; and L. O. McMillan 3 O. B. Rich has been recompleted as a new pay discovery in McMillan-Oil Creek field 9 miles north of Whitesboro.

Standard's 2 Stout topped the Oil Creek at 10,542 ft., drilling sand with oil shows to 10,469 ft. A drill-stem test between 10,461-10,469 ft., using 4,000 ft. of water blanket, had gas in 69 minutes, and flowing oil in 80 minutes. During the remainder of the test, it gaged 11 bbl. of oil through ¼-in. choke, under 1,640-psi. pressure, and 17½ bbl. in 82 minutes when choke was changed to ⅜ in. Flowing pressure remained the same and gas-oil ratio was 4,200 cu. ft. Gravity of the oil was 50°. Operators cored 43 ft. of shale and sand with additional oil shows, to 10,512 ft.

Location is in the Benjamin J. Hutson Survey, A-496, which places it ½ mile south of 7,500-ft. sand production in McKeon field, and 1 mile northwest of Standard's 3 Woodson, a gas-distillate discovery with pay around 10,000 ft.

L. O. McMillan 3 Rich, R. H. Armstrong Survey, A-53, has been plugged back from the field's regular pay at 8,222 ft. for a new potential in Pennsylvanian sand. Flowing through 10/64-in. choke, from new perforations at 7,359-72 ft., the well made 102.4 bbl. of 38° oil a day, with gas-oil ratio of 1,060 cu. ft.

In western Grayson County, Seitz, Comegys & Seitz 2-C Anderson, 2 miles south of Whitesboro and 1¼ miles northwest of production in Mackoy-Strawn field, completed as a flowing discovery. Daily potential through 18/64-in. choke was 87 bbl. of 34° oil, with gas-oil ratio of 325 cu. ft. and tubing pressure 50 psi. Production was through perforations at 4,063-71 ft.

TEXAS GULF COAST

Oil Production Proved in North Fairbanks Gas Area

A deeper pay zone, productive of oil, has been opened in the North Fairbanks gas area, 3 miles northwest of Fairbanks, in Harris County. Discovery well, Rowan Oil Co. and others' 2 Clark Henry, in the J. M. Dement Survey, has been completed with a flow of 79.86 bbl. of 41.2°-gravity net oil daily through ⅛-in. choke Pay zone is perforated at 7,071-74 ft. Previously discovered gas production in the area, west of the main Fairbanks field, is from a 6,500-ft. sand. The new well is approximately 2,500 ft. west of the gas discovery -well, 1 Clark Henry.

Live Oak County Wildcat Indicates Oil Production

Recovery of approximately 700 ft. of clean oil in a drill-stem test of a 4,400-ft. sand encountered in a wildcat test 3½ miles southwest of Dinero, in southeastern Live Oak County, virtually assures opening of another lower Texas Gulf Coast field.

The recovery was made by Lloyd Parker and Cosden Petroleum Corp. in their 1 Maggie McNeill estate. Tester was open 20 minutes through ¼-in. choke, and recorded working pressure of 180 psi. Initial flowing pressure was 1,000 psi. final flowing pressure, 850 psi.; and shut-in pressure 1,900 psi. Interval tested was at 4,435-40 ft.

Hole is being drilled ahead to its original objective of 6,000 ft. Location is midway between Whittington and McNeill fields.

New Deep Pay at Garwood Produces Gas-Condensate

Gas-condensate production is being opened in a new-pay discovery well drilled by Christie, Mitchell & Mitchell northwest of the Garwood area, 10 miles south of Sheridan, Colorado County.

The well, 2 Bass, in the George J. Duncan Survey, testing through ¼-in. choke, flowed at the rate of 2,240,000 cu. ft. of gas daily under pressure of 1,525 psi. Condensate content was estimated at 20 to 25 bbl. per million cubic feet.

Production is from sand zones at 8,625-45 ft. and 8,676-8,700 ft. Nearest well, ½ mile southeast, produces dry gas from Miocene sand at 1,990-2,010 ft.

Five New Wildcats Spur Bee County Exploration

Exploration in Bee County took a spurt the past week with five new wildcat tests getting started, making a total of 11 active wildcat operations in the county.

Two of the new wildcats are being drilled by Alaska Steamship Co., Newman Brothers Drilling Co., and Calvert Corp. One, 1 Faktor Unit, is in the G. Garcia Survey, 2½ miles northwest of Tynan, and about 2 miles south of Tynan field. The other, 1 Montgomery, is in H. H. Williams Survey, about a mile west of 1 Faktor. They are in the southern part of the county, about 2 miles north of the San Patricio county line. Each is projected to about 5,000 ft.

Two miles northwest of Papalote, also in the southern part of the county, George S. Hammonds has a 5,900-ft. wildcat test under way at 1 Carlisle, in the Felix Hart Survey.

In the northwestern part of the county, 2 miles west of Monteola, Luling Oil & Gas Co. is starting a 6,500-ft. test at 1-A Pegue, in the William C. Hill Survey. It is about ¾ mile southeast of the Karnes County line. The fifth new test is a 3,500-ft. operation by Texita Oil Co. and others at 1 Connally, in Teodoro Molina Survey, 3 miles northeast of Beeville.

SOUTHWEST TEXAS

Flores Well Completed

Upper Sullivan sand has proved productive in another well completed by The Texas Co. in Flores field, Hidalgo County, in the

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Rio Grande Valley. The new well, 3-C Yturria, in Antonio Miguel Cana Grant, produced 129.03 bbl. of 48.8°-gravity oil on a 24-hour gage through ⅛-in. choke. Flow was under pressure of 655 psi. with gas-oil ratio of 644 cu. ft. per barrel. Perforated interval is 4,478-82 ft.

New Buda Discovery Well

A new Buda-lime producing area, located 2 miles north of Dede, in Gonzales County, has been opened by M. G. Perry at his 1 Hofferichter, completed on the pump for 70 bbl. of 32°-gravity oil per day. The discovery is designated tentatively as Monthalia field. Pay zone, topped at 5,838 ft. (surface elevation 421 ft.) is perforated at 5,692-5,710 ft. Total depth is 5,838 ft.

LOUISIANA

SOUTH LOUISIANA

New Gas-Condensate Area Opened in Houma District

Warren Oil Corp. has a new, deep gas-condensate well in the Houma area, of Terrebonne Parish, where its 1 South Coast, in 12-17s-17e, is testing sand interval at 11,620-30 ft.

Initial tests through 12/64-in. choke indicated a flow of 3,000,000 cu. ft. of gas daily with pressure of 4,000 psi. Flow carried a good spray of distillate.

The well, located about 4 miles southeast of the deep, high-pressure Hollywood gas-condensate field, and about the same distance west of Bourg field, was drilled to 13,340 ft. Hole is plugged back into the casing, bottomed at 12,645 ft. Pay is believed to be in the Bourg sand, productive in Bourg field.

Production of Hollywood field received another substatial extension during the week where Murmonill Corp. (Clint Murchison) 1 Parche, 1½ miles east of the field, in 96-17s-17e, flowed 1,797,400 cu. ft. of gas with 8 bbl. of 54.6°-gravity condensate per day on tests through 12/64-in. choke. Pay interval is 10,068-74 ft. Present total depth is 10,150 ft., plugged back from 13,262 ft.

Shallower Pay Tested In St. Gabriel Field

Discovery of a shallower gas-condensate sand in the St. Gabriel area, of Iberville Parish, has been made by Continental Oil Co. at its 1 Natalbany.

Testing a perforated interval at 7,704-7,715 ft. through drill-stem, the well flowed at a daily rate of 150 bbl. of condensate and 1,000,000 cu. ft. of gas. The test was open 4¼ hours. Previous tests in the area's deeper levels below 9,130 ft. recovered gas and salt water.

Location, in 19-9s-9e, is on the south side of the producing area.

New Oil-Producing Area Opened Near Bayou Blue

A new producing area, located about 2 miles northeast of Bayou Blue field, in Iberville Parish, has been uncovered with the completion by J. M. Flaitz and R. B. Mitchell of a good producer at their 2 Wilbert, in 58-9s-11e.

Potential gage of the discovery well was 144 bbl. of 40.5°-gravity oil in 24 hours, flowing through 10/64-in. choke. Flowing pressure of 1,350 psi. was recorded with gas-oil ratio of 1,900 cu. ft. per barrel.

Pay interval is 12,484-92 ft. Hole was drilled to 12,822 ft. and has casing run to 12,704 ft.

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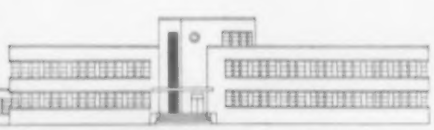

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CALIFORNIA

New Field Added At Sunset Beach

Burt Aston completed a wildcat 1 mile northwest of Huntington Beach production as a new field discovery, flowing at the estimated rate of 400 bbl. daily. The Sunset Beach test, 1 Lomita, was producing from the interval 7,052-7,185 ft. Originally drilled to 4,340 ft., the Osage County test later was drilled to 8,707 ft. and then redrilled to the present depth of 7,185 ft. Gravity of the crude was about 29° A.P.I.

Beverly Test Plugged Back

Universal Consolidated Oil Co. has plugged back 2 Twentieth Century-Fox being slanted from a drilling island on studio lots in the old Beverly oil field. The test, second for the deeper Miocene pool discovered in February, was drilled to 9,143 ft. before being plugged back to 800 ft. for redrilling in a new direction. Faulting was credited as the cause for redrilling. Universal's first well is still shut-in pending completion of a pipeline outlet.

Universal, which had some 200 acres under

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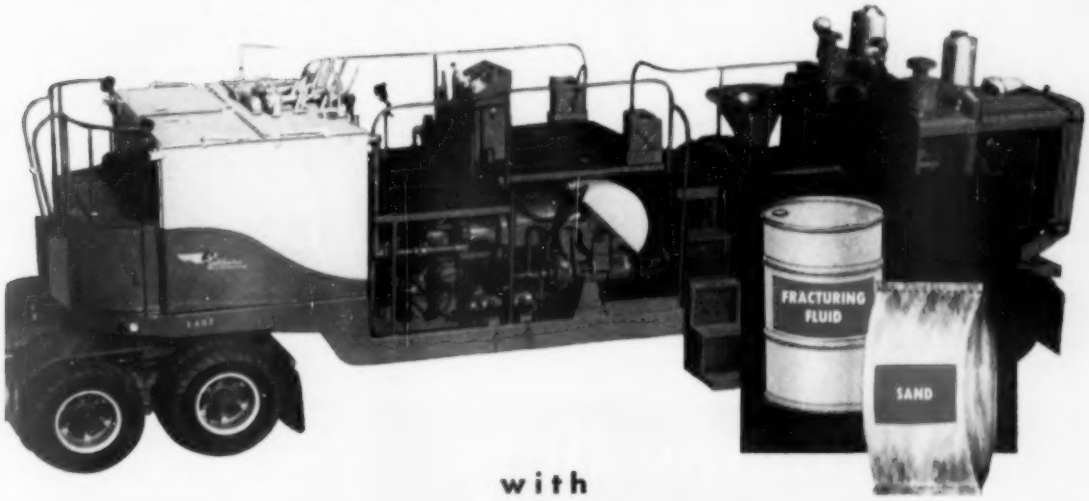

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lease before starting the first well, was attempting to add a community lease adjoining the studio lot on the west. If successfully leased, Universal would slant wells from the studio drill site. Signal Oil & Gas Co., also was working up a 50-acre community lease to the east of the studio lot.

Deep Oxnard Tests Being Completed

Two offsets to the basal Sespe pool discovery earlier this year by Lloyd Corp., Ltd. 1 Livingston were being completed at Oxnard field, Ventura County. Southwest of the discovery Standard Oil Co. of California 2 McInnes had tested at a 1,000-bbl. daily rate, flowing 32°-gravity crude from 9,079-9,396 ft. Lloyd 1 Borchard, the northeast offset, was being tested with hole bottomed at 10,350 ft. and 7-in. casing set a 10,134 ft.

Standard had two tests drilling below 3,300 ft., both in 6-1n-21w. About ½ miles south of the basal Sespe pool discovery, 301 Lenox was under way. West of the Lenox well, ½ mile, 101 Todd was under way as a south offset to Standard 1 McInnes, completed in a 6,000-ft. Sespe pay about a year ago. Also in Section 6 Lloyd was preparing to start a southeast offset to 1 Livingston.

New Tejon-Grapevine Test

Reserve Oil & Gas Co. was preparing to start a north offset at the Olcese sand (Miocene) pool its 42 Pauley discovered in May on the north edge of the Tejon-Grapevine field, Kern County. Pauley 32-34, a west offset, was completed flowing about 500 bbl. of 30°-gravity through a 16/64-in. choke. The new test will be 41 Pauley in NE NE NW 34-11n-19w. Southeast of the discovery Richfield Oil Corp. 53 Tejon-B was coring below 5,800 ft.

Fillmore Test Starting

Standard Oil Co. of California was preparing to drill a confirmation test to the 14,200-ft. Pliocene sand discovery its 1 Sespe Ranch located near Fillmore, Ventura County, in April. Sespe Ranch 2 will be a directional hole in 34-4n-20w, south of the 500-bbl. discovery which was twice redrilled before being completed.

OKLAHOMA

New Pools Named

The Oklahoma Nomenclature Committee has given names to 16 new pools in Oklahoma.

Southeast . . . Southeast Boggy Depot is Gulf Oil Corp.'s new pool in Atoka County. It is the 1 Butler, C SW NE 21-3s-10e.

Southwest . . . In Beckham County Herman Brown 1 Ham, C NE NW 25-10n-26w, opened Southwest Mayfield pool. West Lake Creek pool was opened in Greer County at Boren Oil & Gas Corp. 1 Murray, NE SE NE 4-6n-21w, S. D. Johnson 1 Maquire, SW SW NE 3-3s-19w, opened Northwest Trimue pool in Tillman County.

South-Central . . . Carter County has two new pools, Northwest Oil City, opened by Sinclair Oil & Gas Co. at 1 Voorhees, NE NW NE 13-3s-3w, and Northwest Brock, opened by C. W. Van Eaton at 1 Winters, SW SE SE 12-5s-1w. Calvert Drilling Co. 2 Foster, SE NE NE 14-10n-1e, Cleveland County, opened South Hill pool. Garvin County has two new pools, Northeast Foster and Northwest Purdy, opened by J. L. Hamon 1 Harrison McGee, C SE SW 24-2n-3w, and Sinclair 1 Shelton, C E½ NE SW 15-3n-4w, respectively.

North-Central and Northeast . . . Creek County has two new pools, Northwest Edna and Depew Townsite, opened by Gus Berry 1 Mills, NW NE NE 14-14n-10e, and F. G. Hubbell and R. H. Sigfried 1 Shannon, SE NE NE 12-15n-7e, respectively. Northwest Mayflower pool in Grant County was opened by Davis & Wharton Drilling Co. at 1 Cole, SW NE NW 31-28n-3w. In the Osage M. B. Schriber 1 Osage, SE SE NW 3-25n-7e, opened North Strohm pool.

Payne County got three new pools. Gulf Oil Corp. 1 Mollay, SW NW SW 7-17n-4e, opened East Cottingham pool. Thomas E. Berry 1 Andrews, NW SE SE 28-19n-2e, opened Southwest Stillwater pool, and T. W. and J. M. Loffland, Jr. 1 State, SE SW NW 16-20n-2e, opened Northwest Boomer Lake pool.

Logan-Lincoln Report

Jernigan & Morgan Oil Co. 1 Adams, NE NE NW 9-15n-1e, is a new discovery from an old dry hole.

After fracturing treatment the well flowed 5 bbl. of new oil per hour from the Bartlesville sand. Further fracturing caused the well to flow 15 bbl. of new oil per hour on ¼-in. choke. Testing continues at the second renewal in the same pool. The pool is in southeastern Logan County.

Lang & Unger 1 Bohanon, SE NE NW 34-15n-3w, Logan County, is due production tests. A drill-stem test at 6,169-99 ft. re-

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covered 430 ft. of clean oil and 298 ft. of heavily oil and gas-cut mud. A test taken at 6,174-6,219 ft. recovered 248 ft. of clean oil, 267 ft. of oil and gas-cut mud and 125 ft. of slightly oil and gas-cut mud.

In Lincoln County's Payson pool, Viersen-Cochran 3 Kittredge, NE NE NE 7-12n-5e, flowed 241 bbl. of oil per day from open hole in the Skinner sand at 4,167-4,206 ft. on completion. Testing is under way at 4 Kittredge in SW NE NE 7-12n-5e.

Coal County Wildcat Reports Deep Show in McLish Sand

Pasotex Petroleum Co. and Anderson-Prichard Oil Corp. 1 Underhill et al, deep wildcat in Coal County, lower east-central Oklahoma, reported staining in the McLish sand from 15,365-377 ft. The operators are coring in the McLish with the core barrel below 15,392 ft. The outcome of this deep exploratory effort is of extreme importance to Oklahoma drilling due to its depth and location.

Production Tests Due at Kay County Discovery

C. L. Carlock 1 Boxley, NE NE NE 36-27n-4e, Kay County discovery well, is due production tests in the Prue sand.

The discovery, 4 miles southeast of Northeast Uncas pool, flowed gas in 2 minutes at the estimated rate of 3,000 M.c.f. per day with a spray of oil. Recovery on the drill-stem test at 2,909-50 ft. was 150 ft. of oil and 120 ft. of heavily oil and gas-cut mud.

Good Cleveland Sand Pay Proved at Lincoln Wildcat

Lee Evans Drilling Co. 1 Sudheimer, SE NW SW 24-15n-3e, Lincoln County wildcat, flowed 39 bbl. of oil per hour for 15 hours with 1,500 M.c.f. of gas per day on ½-in. choke after fracturing.

Testing of the Cleveland sand pay continues. Perforations were at 3,356-63 ft.

MICHIGAN

A new Clare County Dundee oil discovery well appeared likely, was acidized, and being equipped with pumping unit for further testing. The new Dundee well, drilled by Basin Oil Co. & Wm. B. Stewart at the 1 Robertson estate, NE SE SW 6-18n-5w, Lincoln Township, logged Dundee top at 3,983 ft. and was bottomed out at 3,987 ft. with 1,000 ft. of free oil showing natural. After a 500-gal. acid treatment, well did not show up as well as it had been expected it would, but by swabbing, load oil was recovered and well had swabbed and flowed about 42 bbl. of net oil and 28 bbl. of water before rig was moved out to install unit. Further testing will be required before any conclusive completion estimate can be made.

KENTUCKY

EASTERN KENTUCKY

In Magoffin County and located on Trace Fork, Kentucky West Virginia Gas Co. have completed 1,019 Allen Wireman for a natural open flow potential of 328,000 cu. ft. of gas daily. Producing formation is the Penn-

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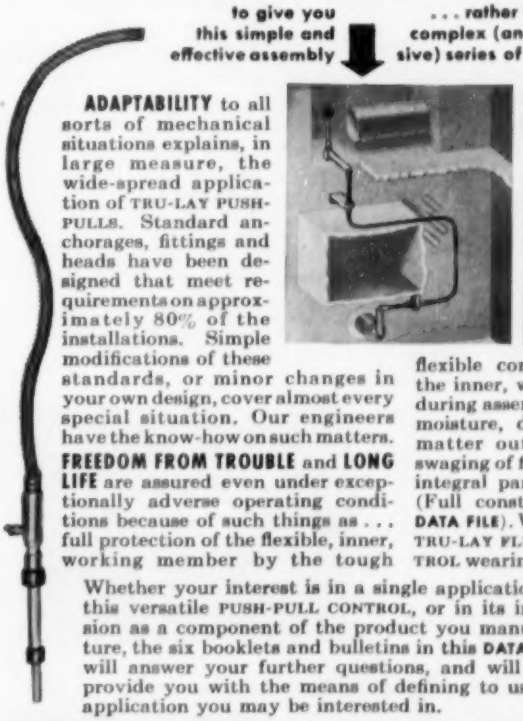
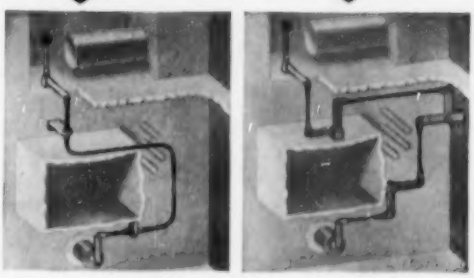


. . . rather than this complex (and expensive) series of linkages



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Whether your interest is in a single application of this versatile PUSH-PULL CONTROL, or in its inclusion as a component of the product you manufacture, the six booklets and bulletins in this **DATA FILE** will answer your further questions, and will also provide you with the means of defining to us the application you may be interested in.

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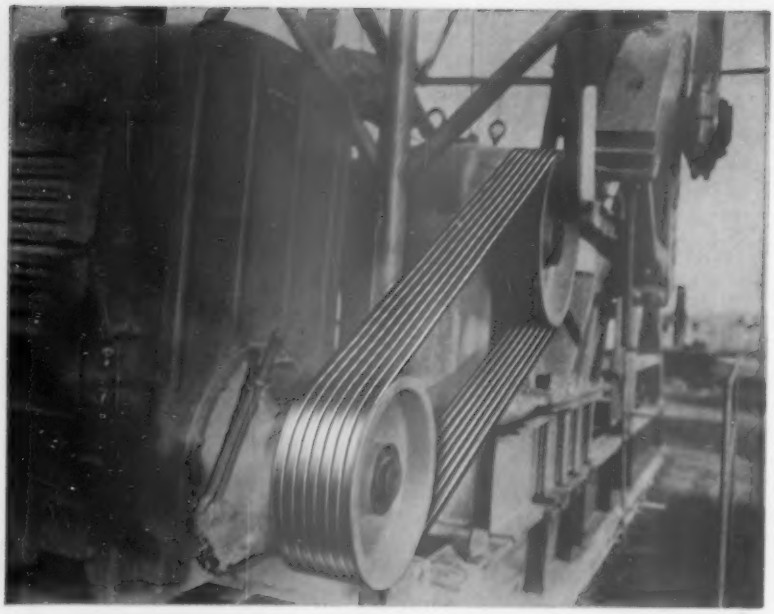

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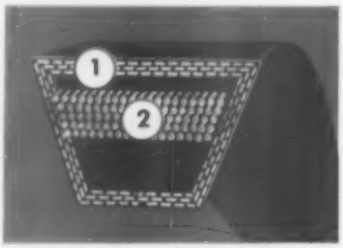

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ROCKY MOUNTAIN

SOUTH DAKOTA

Sioux County Location Announced

The Ohio Oil Co. has made location for 1 Standing Rock Sioux Tibal, NE SW 29-131n-80w, Sioux County. The well is the first in the Williston basin for Ohio, and is the first in the county. Ohio has holdings scattered through the southern and southeastern areas of the basin, and has been active at Indian land sales in this general area for some time.

NORTH DAKOTA

Golden Valley County Wildcat Abandoned

Gulf Oil Corp. has abandoned 1 Bundy-Federal, NW NE 3-143n-103w, in the Trotters area of Golden Valley County. Total depth was 9,328 ft., in Madison. Only slight oil shows were reported. The well is 5 miles to the northwest of an earlier well by Gulf which went to 13,373 ft., and also reported oil shows in Madison.

Eastern Basin Wildcats Spud

Activity on the east side of the Williston basin in North Dakota has been at a more substantial level in 1954 than in previous years since the discovery of oil in the state. Four wildcats in this general area of the basin have been recently spudded. National Bulk Carriers and others spudded 1 Stadum, NW SE 31-154n-70w, Benson County. Shell Oil has started 1 Crum, NW SE 34-156n-70w, in the same county. It is the third in a series projected by Shell in this county. Sun Oil has started 1 Wayne, SE NE 20-162n-69w, Rollette County, on farmout from Union Oil Co. S. D. Johnson is drilling at 1 Hagel, NE NE 30-145n-60w, Wells County.

Morgan County Gas Discovery Tested

Petroleum, Inc. recovered gas at the rate of 2,500 M.c.f. per day from J sand at 1 Schwindt, C SW NE 13-3n-59w, Morgan County. The well is a little more than a mile northeast of the recent discovery at Vallery. At last report the operator was waiting on completion rig with total depth at 6,010 ft. Test was of the zone 5,910-37 ft.

This wildcat is another apparent success through Morgan County, where the heavy rate of exploration since discovery of Odena field has paid dividends.

In the western portion of the county, O'Donnell & Edmondson and Sinclair Oil & Gas Co. have completed 1 Jackson, SW SW SW for a swab gage of 155 bbl. of oil daily. This discovery is about 5 miles east of Masters field production.

Weld County Test Finds Greenhorn Oil

A. T. McDannald recovered oil on test of the interval 6,364-6,400 ft. at 1 Castor, NW NE NE 34-7n-59w, Weld County. Top of Greenhorn is at 6,360 ft. The well is to test

through the Cretaceous series. Tool was open 40 minutes with recovery of 700 ft. of brown, high gravity, dead oil in 40 minutes.

MONTANA

Glacier County Discovery Flows

Union Oil Co. and Carter Oil Co. reported a flow of 77½ bbl. of oil in 24 hours at 1 Tribal-544, C NW NW 19-37n-8w, in the Landslide Butte area of Glacier County. Production was from the zone 5,675-87 ft. in lower Mississippian. The well went to 5,867 ft. total depth in Devonian before perforating the upper zone. The interval was a part of the zone which flowed oil on drill-stem test several days ago, setting off new interest in the north central Montana area. The flow reported in first tests was natural, and the operators will acidize prior to completion.

WYOMING

Eastern Green River Basin Wildcat Staked

El Paso Natural Gas Co. has made location for a wildcat on the Pinedale structure, Sublette County. The well, a projected 15,000-ft. test is in NE SE 9-30n-108w. Location is on the northeast side of the Green River basin, where additional exploration is predicted as a result of the FPC decision permitting construction of the Pacific Northwest gas pipeline.

The El Paso Natural Gas well is on a block of nearly 92,000 acres, which was largely assembled by Malco Refineries of Roswell. Continental Oil Co. also holds substantial interest.

The Pinedale structure is one of the largest in the state. It has had previous tests by Stanolind Oil & Gas Co. and the California Co.

North Fork Confirmation Flows

Stanolind Oil & Gas Co. recovered 68 bbl. of oil in 15 hours through ½-in. choke at 2 Unit, C NW NW 30-44n-81w in the North Fork area of Johnson County. The well produced from Tensleep and is ¾-mile north of the discovery well at North Fork. The discovery was completed in 1951 for a flow of 173 bbl. of oil daily. No further drilling was done until 1954, pending unitization of the area. Top of Tensleep in the discovery well is at 6,486 ft. The field is northwest of Salt Creek and Sussex on the southwestern flank of the Powder River basin.

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Park County Discovery to Deepen

Sun Oil Co. will deepen its 1 Ralston Unit, C NE NW 16-56n-101w Park County to test Madison at about 13,000 ft. The well was a 1953 discovery in Third Frontier. It was drilled to a total depth of 11,246 ft. and plugged back to 9,975 ft. at completion. The potential from Frontier was 200 bbl. 49-gravity oil daily.

CANADA

Gas Flow Recorded at Buick Creek Extension

During a series of drill-stem tests in the Nikanassin formation at the Pacific 3 Buick Creek stepout venture in northeastern British Columbia, natural gas flow rates up to 8,505,000 cu. ft. daily were recorded. This 4-mile extension to the Buick Creek gas-producing area is being drilled by Pacific Petroleums, Ltd., Canadian Atlantic Oil Co., Ltd., Peace River Natural Gas Co., Ltd., and Sunray Oil Co. on lands acquired under exploration agreement with Canada Southern Oils, Ltd.

This new success, located in unsurveyed territory approximately 3½ miles south and 2 miles east of the team's 2 Buick Creek, completed potential gas well, is continuing to core and test in the Nikanassin formation. This new gasser extends to 8 miles the limits of Buick Creek field.

Initial drill-stem test in the gas discovery formation, run of interval 3,803 to 3,853 ft., gave up gas at 362,000 cu. ft. daily; while second test, from 3,852 to 3,863 ft., gave up gas at 6,832,000 cu. ft. per day; and interval 3,863 to 3,874 ft. flowed gas at rate of 8,505,000 cu. ft. daily. Length of tests and pressures recorded were not reported by Pacific, operator of the drilling project.

The team's 2 Buick Creek success was completed in the Nikanassin sand formation with an open flow potential of 19,000,000 cu. ft. daily, after indicating gas production from the Triassic dolomite formation.

A well in the Stettler area of southern Alberta that has been producing natural gas for the past several months has during the past week yielded high gravity black crude oil and may develop into a commercial oil producer.

ILLINOIS

C. E. Brehm 1 Harry Yates Community, SE NW SW 33-6s-8e, White County, swabbed 6 bbl. of oil per hour after fracturing and pump-tested 3 bbl. per hour the first 12 hours from the Aux Vases for a new three pay producer. The Cypress and Paint Creek sands are to be tested.

In Wabash County 4 miles southwest of Keensburg, S. W. Bardill has set casing on 1 Bertha and Anna Shultz, NW NW SE 31-2s-13w. The well flowed clean oil on drill-stem test of the McClosky lime at 2,790-96 ft. and 2,840-47 ft.

INDIANA

In Posey County 10 miles southwest of Mt. Vernon, Hoosier Drilling Co. 1 Leonard, SW NE SW 20-8s-14w, is going on the pump to test the Cypress sand. It swabbed 6 bbl. of oil per hour after fracturing.

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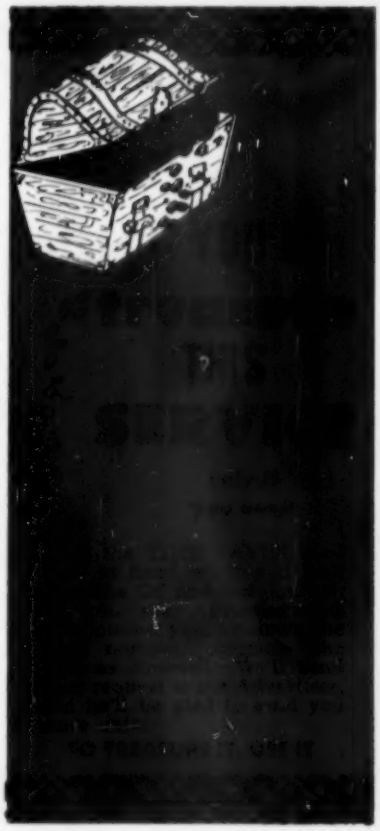

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

District 1

Frio County: Alaska Steamship Co. et al 1-B Oppenheimer, L. Zurcher 31, A-685. Dry. TD 5,111 ft.

Gonzales County: Sutton Drilling Co. 1 Kelly, B. D. McClure Sur., A-41. Dry. TD 3,280 ft.

McMullen County: Chicago Corp. 1 Byrne, Share 5, George Pittuck Sur., A-10. Dry. TD 983 ft.

Medina County: Rest Oil Co. 1 Ward-Wendland, E. H. Durst Sur. 16. Dry. TD 1,202 ft.

District 4

Duval County: J. W. Gorman et al 1 Adami, Arnold & Barrett Sur. 47, A-768. IP 8,500 M.c.f. daily, open-flow potential, dry gas, perforations 2,018-30 ft. TD 2,175 ft.

J. W. Gorman 1 Wright, A&B Sur. 47, Certificate 9, Dry. TD 2,210 ft.

Hidalgo County: Heep Oil Corp. et al 1 Mary O'Brien-Shary Unit, Lot 53-1, West Addition to Shary Land, Subdivision of Porcion 53-57. IP 18,000 M.c.f. daily, open-flow potential (estimated), perforations 6,604-14 ft. TD 9,530 ft. (New field.)

Pure Oil Co. 1 Farm Tract 2006 Unit, Sec. 119, North Capisallo District Subd., Llano Grande Grant, A-54. Dry. TD 10,083 ft.

Taylor Oil & Gas Co. 2 Woods Christian et al, Share 16-A, San Ramon Grant. Shut-in gas well, ungaged, perforations 8,413-19 ft. TD 10,050 ft. (New field.)

Jim Wells County: La Gloria Corp. 36-Blucher, Sur. 363-A, IP 52.2 BOPD, ½-in., 40.2° perforations 7,338-44 ft. TD 7,700 ft. (New pay in Tijerina-Canales-Blucher field.)

Reese & Dunn 2 Perez, Share 6-E, Blk. 3, Cushing Oil & Gas Co. Subd., La Tinaja de Lara Sur., A-36. IP 13,500 M.c.f. daily, open-flow potential, with 8.75 BC per M.M.c.f., Bierstadt sand 4,775-81 ft. (perforations), and 1,700 M.c.f. daily, open-flow potential, with 6.75 BC per M.M.c.f., Lou Ella sand 5,134-44 ft. (perforations). TD 5,400 ft.

H. G. Watson, trustee, 1 Price, J. Almond Sur. 12, A-28. Dry. TD 3,260 ft.

Nueces County: Kirkwood & Morgan 1 Swetlick, Gregorio Farias Grant, A-592. IP 25,000 M.c.f. daily with 25 BC per M.M.c.f., open-flow (estimated), perforations 5,355-60 ft. TD 6,522 ft. (Extends East Robstown field.)

Rock Hill Oil Co. 1-A Wood, Lot 5, Wade-Riverside Subd. IP 186.99 BOPD, 9/64-in., 38°, perforations 8,230-35 ft. TD 8,755 ft. (New pay in Calallen field.)

Vaughn, Zoch & Turnbull 1 Boggan, Sec. 105, G. H. Paul Subd., Driscoll Ranch. Dry. TD 8,523 ft.

Starr County: Clark Fuel Producing Co. 1 Salinas, Parcel 2-A, Tract 1, Share 3, La Sacatosa Grant. Dry. TO 2,351 ft.

Webb County: G. C. Mortimer, Jr., 1-15 Kirkpatrick, Blk. 1, CCSD&RGNG Sur. 15. Dry. TD 2,005 ft.

Wymore Oil Co. 1 Billings, Survey 712. Dry. TD 2,620 ft.

TEXAS GULF COAST

District 2

Bee County: Charles Katz and J. B. Moore 1 Turner, G. Page Sur., A-249. Dry. TD 3,606 ft.

Stice Drilling Co. and W. M. Averill 1 Fox estate, Michael Fox Sur., A-24. Dry. TD 5,662 ft.

Calhoun County: Arkansas Fuel Oil Corp. 1 State Tract 107, San Antonio Bay. Dry. TD 9,940 ft.

DeWitt County: Coastal Trend Oil & Gas Corp. 1 Pargmann, Antonio Lazo Sur., A-653. Dry. TD 4,070 ft.

Kirkwood & Co. 1 Barre, James Quinn Sur., A-395. IP 24,000 M.c.f., open-flow potential, plus ungaged condensate, 56.6°, Wilcox 8,105-14 ft. (perforations). TD 8,323 ft. (New field.)

Earl G. Bateman 1 Mugge heirs, W. H. Crain Sur., A-633. Dry. TD 8,212 ft.

J. R. Butler 1 Baumann, Stephen Prather Sur., A-385. Dry. TD 7,314 ft.

Goliad County: A. B. Alkek 1 Bego, Thomas C. L. Durocher Sur., A-112. Dry. TD 4,250 ft.

Jackson County: Eugene Talbot et al 1 Tourtellot, William Whitaker Sur., A-79 (Morales area). Dry. TD 4,820 ft.

J. K. Dorance 2 McCarty, W. J. Wickham Sur., A-272. Dry. TD 3,150 ft.

J. M. Huber Corp. 1 Hackbarth, Jemina Heard Sur. A-28. Dry. TD 6,510 ft.

Magnolia Petroleum Co. 1 Robinson, John Jones Sur., A-36. Dry. TD 4,814 ft.

Live Oak County: F. William Carr 2 West, Lot 414, Blk. D, Cameron County School Land Sur. Shut-in gas well, ungaged, perforated 6,104-08 ft. and 7,671-87 ft. TD 8,191 ft. (New field.)

C. G. Dunwoody, Jr., 1 Tom Slick, trustee, V. Chapa Sur. 320, A-739. Dry. TD 2,878 ft.

Sid Katz and Holly Development Co. 1 Watson et al, F. A. Rogers Sur., A-406. Dry. TD 4,239 ft.

Victoria County: Edward L. Johnson and

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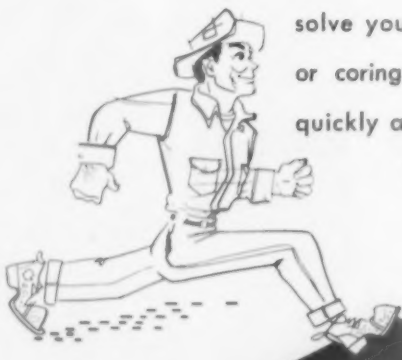

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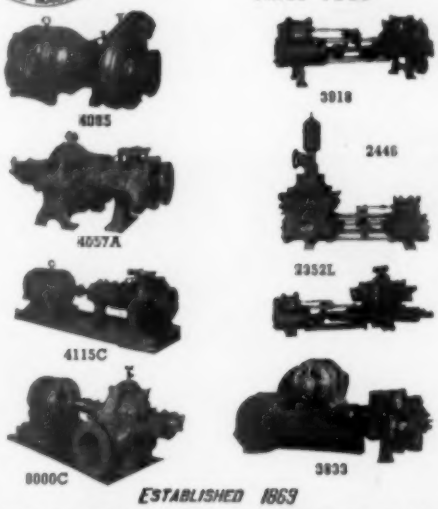

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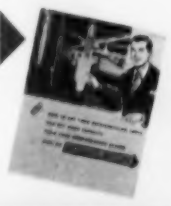

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Other Costs, including bits	7,850.00
Month Total	$23,650.00
Number of Profiles — 160	
Cost per Profile	$147.81

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West Texas Division
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WILDCAT COMPLETIONS

Reagan Tucker et al 1 Victoria County, J. M. Hernandez Sur., A-59. Dry. TD 6,302 ft.

Arnold O. Morgan and Gulf Oil Corp 1 Atkinson, L. Navarro Sur., A-89. Dry. TD 9,000 ft.

District 3

Brazoria County: Caroline Hunt, trust estate, 1 Pratt, Lot 1, Texas Real Estate Investment Co. Subd., Charles Garrett Sur., A-63. Dry. TD 9,612 ft.

Texas Eastern Production Corp. 1 North Rowan Unit 3, F. Moore Sur., A-100. IP 1,550 M.c.f. daily, open flow, gas-condensate ratio 4,741 cu. ft. per barrel, 50.8°, perforations 10,263-73 ft. TD 11,501 ft. (New pay in North Rowan field.)

H. E. Williams 1 Winans-Barrow Unit, HB & T Sur. 66, A-560 ft. Dry. TD 8,200 ft.

Chambers County: McCarthy Oil & Gas Corp. 1 Frankland et al., Samuel Mather Sur. 12, A-190. Shutin gas well (no gage). TD 12,278 ft. (Extends South Mayes area.)

Colorado County: Robert Mosbacher 1 Kallina, Sam Kennelly Sur., A-30. Dry. TD 3,824 ft.

Galveston County: John W. Mecom 1 Dedde et al. Unit, Block 81, A. Edwards Sur., A-10. Dry. TD 9,355 ft.

Hardin County: W. Stewart Boyle and Kirby Oil & Gas Co. 1 Crow et al., J. C. Anderson Sur., A-61. Dry. TD 7,902 ft.

Harris County: Ohio Oil Co. 1 Dwyer et al., George M. Patrick Sur., A-624. IP 175 BOPD, 9/64-in., 43.2°, perforations 7,012-22 ft. TD 8,513 ft. (New field.)

Liberty County: San Juan Exploration Co. et al. 1 Willis, T&NO Sur. 15, A-369. Dry. TD 8,252 ft.

Matagorda County: Texas Gulf Producing Co. and Rowan Oil Co. 1 Armstrong et al. Unit, Block 6, Francita Subd., William New Sur., A-366. Dry. TD 9,480 ft.

Montgomery County: Christi, Mitchell & Mitchell 1 Coe, I. W. Brashear Sur., A-90. IP 9,500 M.c.f. daily, open flow, gas-condensate ratio 125,000 cu. ft. per barrel, 55°, perforations 5,452-68 ft. (Brautigam sand). TD 5,702 ft. (Extends Decker's Prairie field.)

U. S. Epperson Underwriting Co. 2 Southland, Walker County School Land Sur., A-494. Dry. TD 9,512 ft.

Orange County: Houston Oil Co. of Texas and American Republics Corp. 1-A Lindsay et al., Josiah Reeves Sur., A-164. IP 65.28 BOPD, 6/64-in., 42.4°, perforations 7,788-91 ft. TD 8,602 ft. (Extends Lemonville field.)

Washington County: J. Ray McDermott & Co., Inc., 1 Lott, William Gates Sur., A-21. Dry. TD 10,521 ft.

Wharton County: W. Stewart Boyle 1 Stockton et al., S. D. Hanna Sur. 5, A-689. TD 6,151 ft.

Johnson & Appling 1 Leissner, ETRR Sur. 87, A-97. Dry. TD 7,762 ft.

EAST TEXAS

Anderson County: J. R. Meeker 1 Warren, D. Crist Sur., A-183. Dry. TD 5,471 ft.

Angelina County: Union Producing Co. 1 Fenley, Barr & Davenport Sur., 4½ miles NW Redland. IP 15,000 M.f.g., open flow, RP 3,275 psi., perforated Glen Rose 7,448-78 ft. TD 11,511 ft.

Camp County: W. M. Coats et al 1 Barrett, A. J. Ward Sur., A-120. Dry. TD 4,580 ft.

Hunt County: Intex Oil Co. 1 Dodd, James Adkinson Sur., A-1. Dry. TD 3,525 ft.

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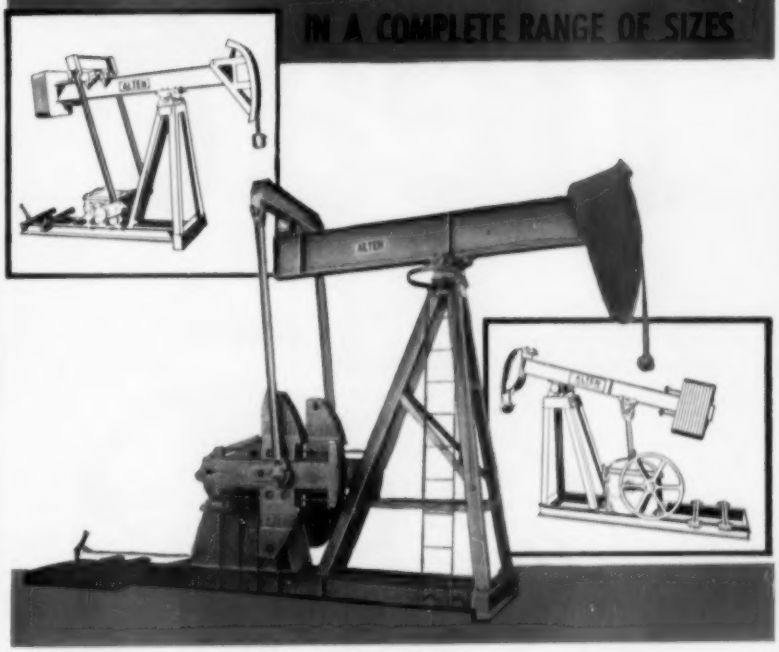

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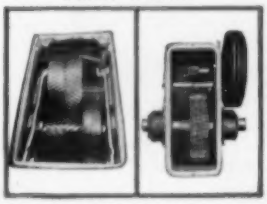
Rugged enough to meet harshest oil field requirements, yet so amazingly simple it can be adjusted in minutes by one man on the ground.

Crank calibration locates weights for desired counterbalance. Weights cannot fall during adjustments — they are safely locked in position at all times.

TWO GREAT GEAR BOXES



Some pumping situations demand herringbone gears for peak performance, others helical. *Only Alten offers both.* No need to compromise — get the proper gear train every time.

4 WAY ADJUSTABLE SADDLE — BRONZE BUSHED BEARING

Matchless for long wear and convenience. Simply rotate to a new bearing surface and obtain several times ordinary life. Walking beam may be adjusted laterally and to and from the well for exact centering.

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Foundry & Machine Works, Inc.
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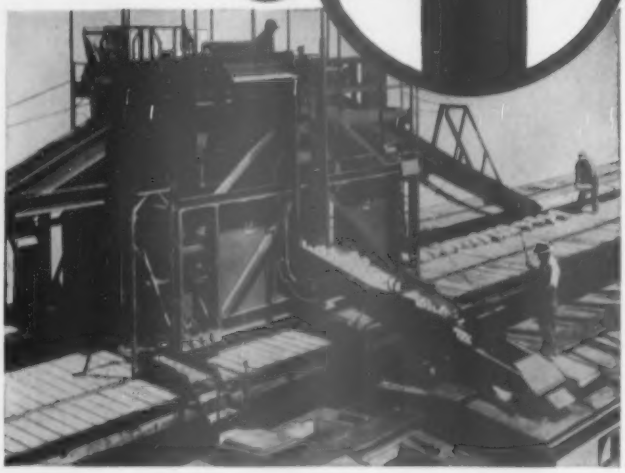
Call Santa Fe



This giant machine ices a car a minute to keep pace with the fast service Santa Fe performs to move perishables. This is just one example of how we do a job for our shippers. So when the heat is on, no matter what you have to ship, just call your Santa Fe freight man.

F. H. ROCKWELL
General Freight Traffic Manager, Santa Fe Lines
Chicago 4, Illinois

WILDCAT COMPLETIONS

Jack & Delbert Powell 1 Grimberg, Amos Smith Sur., A-945. Dry. TD 3,338 ft.

Kaufman County: Thos. D. Humphrey & Sons 1 Clark, E. Ables Sur. Dry. TD 5,274 ft.

Navarro County: Fowler & McGee 1 Bounds, J. W. Simmons Sur. Dry. TD 1,715 ft.

Robertson County: Claude V. Brown 1 Gibson, Sara Ann Walker Sur. Dry. TD 3,468 ft.

Sabine County: M. L. Howard 1 Jones, L. B. Anthony Sur., A-64. Dry. TD 3,100 ft.

TEXAS PANHANDLE

Sherman County: Humble Oil & Refining Co. 1 Taylor, C NE NE 1-T-94. T&NO. Dry. TD 3,546 ft.

WEST CENTRAL TEXAS

Brown County: John W. Ellis 1 Teters, Moses Little Sur. 40. IP 25 BOPD, 35°, Marble Falls 2,250-2,300 ft. GOR 1,000 cu. ft., TP 150 psi. TD 2,332 ft.

R. D. Jackson et al 1 Pearl Johnson, J. V. Vaughn Sur. 2. Dry. TD 930 ft.

L. E. Trout 1 Lee, J. Alford Sur., A-5. Dry. TD 3,022 ft.

Callahan County: Forrest W. Gregory 1 Fortune, G. M. Vigal Sur. 798. IP 78 BOPD, 10/64-in., TP 275 psi., 44°, Cross Plains sand 1,769-74 ft. TD 1,778 ft.

Intex Oil Co. 1 Jackson, 67-11-T&P. IP 174 BOPD, 8/64-in., TP 425 psi., GOR 328 cu. ft., 40°, Ellenburger 4,347 ft. TD 4,362 ft.

A. W. Krause 1 Williams, Sec. 159, University Lands Sur. Dry. TD 2,307 ft.

Coleman County: James K. Anderson 1 Jameson, J. H. Wood Sur. 483. Dry. TD 2,002 ft.

Hill & Hill et al 2 Gordon, T. B. Frizzell Sur. 711. Dry. TD 2,562 ft.

Jones County: J. J. Lynn 1 Martin, Sec. 5, GH&H Sur. Dry. TD 3,457 ft.

Murphy Oil Co. of Oklahoma 1 Harrell, Sec. 7, OAL Sur. IPP 110 BOPD, 38°, King sand 2,268-70 ft. TD 2,349 ft.

Skelly Oil Co. 1 Barkley, 8-17-T&P. IP 231.8 BO in 4 hours, ¾-in., TP 210 psi., GOR 988 cu. ft., 41°, Strawn perforations 4,566-72 ft. TD 4,580 ft.

Nolan County: Lowry Oil Co. 1 Adrian, 45-20-T&P. Dry. TD 6,905 ft. Elev. 2,532 ft., Ellenburger 6,450 ft., Wilburns dolomite 6,752 ft., Cambrian sand 6,850 ft.

C. L. Norsworthy Jr. 3 Brooks, 70-X-T&P. IP 138 BOPD, ⅜-in., TP 80 psi., GOR 650 cu. ft., pay 5,186 ft., TD 7,430 ft.

Sinclair Oil & Gas Co. 1 Gulf, Colorado & Santa Fe, 36-22-T&P. Dry. TD 6,521 ft. Elev. 2,570 ft., Ellenburger 6,396 ft.

Palo Pinto County: A. W. Komarek 1-A Stuart, 80-3-T&P. Dry. TD 1,503 ft.

Shackelford County: J. K. Wadley 1 Wagley, Sec. 29, University Lands. Dry. TD 2,340 ft.

Stephens County: P. W. Pitzer 1-C Pitzer, 8-4-T&P. Dry. TD 3,983 ft.

Taylor County: C. M. Ashby 1 Phil Ford, James C. Eccles Sur. 472. Dry. TD 4,545 ft.

A. W. Cherry 1 Christian, 164-64-H&TC. Dry. TD 6,169 ft.

Throckmorton County: Trans Tex Drilling Co. 1 Gentry, TE&L Sur. 2319. Dry. TD 4,809 ft.

Woodson Oil Co. 1 Sanders, W. P. Bennett Sur., A-1358. Dry. TD 4,785 ft.

NORTH TEXAS

Archer County: M. W. Blair 1 Long, Blk. 94, J. W. Harris Subd. Dry. TD 1,431 ft.

M. W. Blair 1-A Long, Blk. 94, Harris Subd. Dry. TD 1,425 ft.

WILDCAT COMPLETIONS

W. A. Lofton 1-A Petrex, Blk. 114, ATNCL Sur. Dry. TD 1,525 ft.

Megargel Drilling Co. 1 Fichte, Blk. 23, W. E. Probert Sur. Dry. TD 1,459 ft.

Baylor County: Bridwell Oil Co. 1 Hostas, 18-1-D&W. IPP 71.6 BOPD, 39°, pay 1,434 ft. TD 1,439 ft.

Texkan Oil Co. 2 Higgins, C. Winters Sur., A-558. IPP 186 BOPD, 46°, GOR 376 cu. ft., Caddo 4,969 ft. TD 4,975 ft.

Cooke County: Morty Freeman 1 Stobaugh, BBB&C Sur., A-160. Dry. TD 2,362 ft.

Lawrence Hillhouse 1 Fisher, Eben Reed Sur., A-849. Dry. TD 1,010 ft.

Sussex Oil Co. 1 Redman, H. H. Davis Sur., A-323. Dry. TD 3,303 ft.

Williams Drilling Co. 1 Hutson, SPRR Sur., A-970. Dry. TD 3,002 ft.

Denton County: Jess Hickey Oil Corp. 1 Waide, S. Yoachum Sur., A-1438. IP 101 BOPD, 10/64-in., TP 120 psi., 41°, GOR 400 cu. ft., Strawn pay 1,700 ft. TD 1,705 ft.

Grayson County: Ada Oil Co. 1 Fielder, A. Berry Sur., A-130. Dry. TD 7,066 ft.

Jack County: W. D. Kerbow 1 Prideaux, Blk. 20, S. E. Wilson Subd. Dry. TD 650 ft.

Frank Wood Associates 1 Brasius, Mary Hamilton Sur., A-262. IP 91 BOPD, 12/64-in., 43°, TP 110 psi., GOR 350 cu. ft., Strawn 3,002-14 ft. TD 4,763 ft.

Knox County: Thos. D. Humphrey & Sons 1 Walker, 58-13-H&TC. Dry. TD 5,110 ft.

The Texas Co. 1 Hamilton, NCT-3, 55-13-H&TC. Dry. TD 6,370 ft.

Wichita County: Alexander Goldsmith 1 Kempner, Blk. 53, KWVFL Sur. Dry. TD 4,250 ft.

Wilbarger County: Brown Drilling Co. 1 Waggoner BMC, 39-4-H&TC. Dry. TD 2,010 ft.

Frank Wood Associates 1 Waggoner "Dan," 30-4-H&TC. Dry. TD 2,507 ft.

Frank Wood 4 Waggoner "Victory," 39-A492-MEP&P. Dry. TD 1,925 ft.

Wise County: Christie, Mitchell & Mitchell 1 Bullard, A. C. Caruthers Sur., A-171. IP 2,668 M.f.g., 24/64-in., TP 853 psi. Pay 5,875 ft. TD 5,876 ft.

Christie, Mitchell & Mitchell 1 Carter Gas Unit, G. D. Hendrix Sur., A-396. IP 2,006 M.f.g., plus 14 bbl. distillate, 19/64-in., TP 1,033 psi., pay 5,872 ft. TD 5,873 ft.

Christie, Mitchell & Mitchell 1 Gunhild Weber, Blk. 72, Matagorda CSL Sur., A-534. IP 2,300 M.f.g., plus 16 bbl. distillate, 19/64-in., TP 1,188 psi., pay 6,189 ft. TD 6,190 ft.

Young County: H. D. Egger 1-B Pace & Strange, Blk. 10, A. Rohus Sur., A-240. Dry. TD 3,653 ft.

McMahon-Bullington Drilling Co. 1 Daws, TE&L Sur. 723. TD 3,923 ft.

Rankin & Karper 1-A Alexander, Nicholas Lynch Sur., A-172. IP 144 BOPD, 14/64-in., 41°, TP 450 psi., GOR 920 cu. ft., Caddo lime 4,036 ft. TD 4,048 ft.

Rankin & Karper 1 Finley estate, J. P. Everett Sur., A-2074. IP 216 BOPD, 24/64-in., 42°, TP 460 psi., GOR 1,780 cu. ft., conglomerate 4,022-32 ft. TD 4,123 ft.

Timberlake & Scott & Kelleher 1 Routen, TE&L Sur., Blk. 24. Dry. TD 3,413 ft.

SOUTHEAST NEW MEXICO

Eddy County: Makin Drilling Co. 1 Federal-Angel, 29-16s-28e. Dry. TD 10,012 ft. Elev. 3,573 ft., Wolfcamp 6,550 ft.

Richardson & Bass 1 Harrison-Federal, 12-25s-30e. Dry. TD 16,705 ft. Elev. 3,378 ft., Pennsylvanian 13,720 ft., first Mississippian 15,885 ft., 2nd 16,075 ft., Devonian 16,622 ft.

Richardson & Bass 1 Legg, 27-22s-30e. IPP 69 BOPD, plus 201 BWPD, 42°, GOR 639 cu. ft., final perforations (?), plugged back TD 6,122 ft. Elex. 3,309 ft., Bone Springs 7,532 ft., Wolfcamp 11,240 ft., Mississippian 14,870 ft.

WEST TEXAS

Coke County: Ashmun & Hilliard, Ltd. 1 Bridges, 386-9-Johannes Orth Sur. Dry. TD 5,567 ft.

Crockett County: Pure Oil Co. 1-E Bean "A," 81-OP-GC&SF. IP 228 BOPD, 16/64-in., 41°, TP 150 psi., GOR 336 cu: ft. Pay 7,722 ft. TD 7,802 ft.

Dawson County: Cosden Petroleum Corp. 1 Lindsey, 132-M-EL&RR. Dry. TD 12,515 ft. Elev. 3,025 ft., Canyon 10,578 ft., Strawn 10,808 ft., Siluro-Devonian 12,310 ft.

Seaboard Oil Co. 1 Dean, 3-2-TTRR Sur. TD 8,750 ft. Elev. 2,855 ft. Reef 8,684 ft.

Hockley County: Humble Oil & Refining Co. 1 Ellwood estate "C," 25-14-Howard CSL. Dry. TD 10,423 ft.

Howard County: McSpadden, Green and Ray Harris & Co. 1 Gilliam, 48-32-T3N-T&P. Dry. TD 8,206 ft. Elev. 1,710 ft. Clear Fork 4,500 ft.

Lamb County: J. W. Murchison 1 Lisso, Labor 12, League 687, Abner Taylor Sur. Dry. TD 6,584 ft.

J. M. Welborn 1-A Hilbun, 6-675-Texas State Capitol Land Sur. Dry. TD 4,444 ft.

Midland County: Forest Oil Corp. and Cities Production Corp. 1 Dora Roberts C-4, 46-41-T3S-T&P. IP 3,170 BOPD, 1-in., 49°, TP 625-590 psi., GOR 1,108 cu. ft.,

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There's an R & M "All-Weather" Motor that's built for YOUR job!

Triple-Rated—for changing power needs. Slight additional cost is quickly written off by power savings. You buy power only for the connected horsepower you need. As requirements change, you change the horsepower—*without changing motors.*

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High Torque—to meet heavy starting problems.

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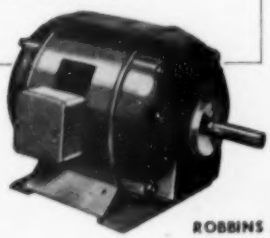

If ever a motor riled a rodent, it's the R & M "All-Weather" motor! Pack rats, snakes and field mice just can't get inside—because all R & M motors are rat-proofed at the factory, *at no extra charge!*

And, that's only one of many R & M features that save you money . . . *exclusive* features such as:

- **Full-height end-heads to protect internal parts of motor against damage.**
- **Special treatment to resist moisture and corrosion.**
- **"Clean-Sweep" ventilation for cool running.**
- **Extra-large, factory-lubricated sealed bearings; forget 'em for at least 5 years.**

Even with all these features, R & M motors are sold at a standard motor price. One trial, and you'll agree they're the finest your money can buy!

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It has valuable data on construction, service and specifications. Write for your free copy—and name of your nearest R&M distributor. Robbins & Myers, Inc., Motor Division, Springfield 103, Ohio.

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"All-Weather" is a Robbins & Myers, Inc. trademark

WILDCAT COMPLETIONS

Ellenburger open hole 13,040-13,233 ft. TD 13,233 ft.

Livermore Drilling Co. 1 Roy Parks, 26-40-T3S-T&P. Dry. TD 11,000 ft. Elev. 2,870 ft., Pennsylvanian 10,364 ft.

Runnels County: Frank Ausauka and Ab-Tex Drilling Co. 1 Dickinson, Charles Osgood Sur. 364, A-393. Dry. TD 4,950 ft.

Keith D. Graham 1 Ashton, Sec. 143, ETRR Sur. Dry. TD 2,505 ft.

W. W. Harvey 1 Giesecke, Sec. 27, Heirs of James Hughes Sur. Dry. TD 4,238 ft. Elev. 1,672 ft., Ellenburger 3,425 ft., Cambrian sand 3,850 ft., pre-Cambrian 4,202 ft.

Thos. D. Humphrey & Sons 3 Tounget, Sec. 31, Domingo Diaz Sur., A-115. IP 34.5 BOPD, Jennings sand 3,723-28 ft., TP 160 psi., GOR 165 cu. ft. TD 3,844 ft.

Richardson & Bass 1 Cook, Subd. 34, Mathias Bishop Sur. Dry. TD 6,317 ft.

Vincent & Welch, Inc. 1 Brookshire, Sec. 140, Sam Brookshire Sur. Dry. TD 3,935 ft.

Schleicher County: Plymouth Oil Co. 1-28 Thomson, 28-A-HE&WT. Dry. TD 3,490 ft.

Scurry County: Union Oil Co. of California and Lone Star Producing Co. 1 Boone, 98-2-H&TC. Dry. TD 7,605 ft. Ellenburger 7,325 ft.

Sutton County: Blue Bonnett Oil & Gas Co. 1 Walker estate, 63-K-GH&SA. IP 119.8 BOPD, ¼-in., TP 150 psi., GOR 1,361 ft., 35°, Canyon reef pay 2,946-64 ft. TD 6,913 ft.

C. L. Norsworthy Jr. 1-A Valliant, 12-5-TW&NG. Dry. TD 4,726 ft.

Terry County: Texas Crude Oil Co. 1-38 Treadway, 38-K-PSL Sur. Dry. TD 11,076 ft. Elev. 3,514 ft., Wolfcamp 9,700 ft., canyon reef 10,058 ft.

Tom Green County: Dalton H. Cobb 1 Nasworthy, Sec. 3, F. B. Cogswell Sur. Dry. TD 205 ft.

E. H. Cox 1 Funk, 22-5-H&TC. IPP 9 BOPD, 24°, San Andres pay 784 ft. TD 874 ft. SE extension.

Stanolind Oil & Gas Co. 1-G Johnson, Adam Byler Sur., 9 miles NE Christoval. Dry. TD 6,059 ft. Elev. 2,032 ft., Ellenburger 5,850 ft., Cambrian sand 6,032 ft.

Ward County: W. P. Luse & C. O. Ice 1-A Dorr, 2-32-H&TC. IPP 15 BOPD, 37°, GOR 733 cu. ft., lower Permian pay 5,952-96 ft. TD 7,096 ft.

C. E. Marsh 1 Brown heirs, 34-1-H&TC. Dry. TD 6,500 ft. Elev. 2,418 ft., Devonian 6,080 ft.

Winkler County: Magnolia Petroleum Co. 1 University "D," 31-21-University Lands. Dry. TD 5,241 ft. Elev. 2,777 ft., Delaware sand 5,033 ft.

Yoakum County: Edwin L. Cox 1 Gammon, Sec. 675, Blk. D, J. H. Gibson Sur. Dry. TD 5,355 ft.

ILLINOIS

Macon County: A. A. Richey 1 Royce, NE SW SW 24-16n-1w. Dry. TD 1,899 ft.

TENNESSEE

Fentress County, Wolf River: Williams et al 4 Pyle, SE NE NE 13-A-55e. Dry. TD 1,200 ft. 3 Pyle, SW SW NW 12-A-55e. Dry. TD 1,300 ft.

Pickett County, Travisville: Buckner et al 1 Beatty, NW SW SW 25-B-55e. Dry. TD 986 ft.

Robertson County, Barren Plains: Jackson et al 1 Bell, SW SE 24-B-32e. Dry. TD 1,660 ft.

MICHIGAN

Gratiot County: Leonard Oil, Inc., & McClure Oil Co. 1 Gager, SW SW NE 19-10n-4w. Dry. TD 3,295 ft. in Dundee.

Isabella County: McClure Oil Co. & I. W. Hartman 1 Renwick, NW SE NE 5-13n-6w. Dry. TD 3,706 ft. in Dundee.

Van Buren County: C. W. Collin 1 Mech, NE NE NW 27-2s-14w. Dry. TD 1,274 ft. in Traverse lime.

Washtenaw County: O. K. West 1 Rogers, SE SE NW 23-1s-7w. Dry. TD 4,559 ft. in Trenton lime.

Wayne County: C. W. Collin 1 Whipple, NE NE NW 4-1s-8e. Dry. TD 4,695 ft. in Trenton lime.

WEST VIRGINIA

Webster County, Glade district: Gregory Gas Co. 1 T. C. McElwain, elevation 2,250 ft., 3,921,000 cu. ft. gas, Maxon sand 1,419 ft., gas 1,435-1,494 ft., TD 1,494 ft.

FLORIDA

Gulf County: A. R. Temple 1 Lister, C NE SW 33-5s-9w. Dry. TD 4,996 ft. Elev. 30 ft., lower Tuscaloosa 4,856 ft.

ALABAMA

Marengo County: Ray B. Kelly 1 Owensby, C SE NE 35-16n-2e. Dry. TD 3,500 ft. Elev. 109 ft., Lower Cretaceous 3,370 ft.

MISSISSIPPI

Adams County: Lyle Cashion Co. et al. 1-C Stowers, 24-8n-2w. Dry. TD 6,015 ft. Elev. 244 ft., Wilcox 3,866 ft., base Baker shale 5,666 ft.

Olin Oil & Gas Corp. 1 Parker, 2-3n-5w. Dry. TD 8,141 ft. Elev. 59 ft., Wilcox 5,212 ft., base Big Shale 6,550 ft.

Jackson County: C. A. Floto 1 State of Mississippi, Mississippi Sound. Dry. TD 13,041 ft. Elev. (derrick floor) 22 ft., Wilcox 4,600 ft., Lower Cretaceous 10,131 ft.

SOUTH LOUISIANA

Cameron Parish: Superior Oil Co. 4-A Bureau of Land Management, Blk. 149, West Cameron area, Gulf of Mexico. IP 2,128 M.c.f. daily and 1.65 BCPD, 18/64-in., 47.2°, perforations 8,752-59 ft. TD 8,808 ft. (New gas pay in West Cameron Blk. 149 field.)

St. Charles Parish: The Texas Co. 2 Rathborne, 18-14s-12e. IP 296 BOPD, 10/64-in., 33.8°, perforations 12,429-33 ft. TD 12,450 ft. (New pay, and extends Boutte field.)

NORTH LOUISIANA

Bossier Parish: J. C. Mayfield 2 Emmie D. McCloud, C NE NE NE 13-19n-11w. Dry. TD 3,150 ft.

Sabine Parish: Grey Wolf Drilling Co. 1 Peter Leone et vir, 8-7n-13w. Dry. TD 5,884 ft. Deep test in Zwolle field.

ARKANSAS

Lafayette County: J. K. Wadley and Walter Ketith 1 Nabors, 18-15s-22w. Dry. TD 2,750 ft.

Nevada County: Ashland Oil & Refining Co. 1 Pelt, C NW SW 24-14s-23w. Dry. TD 5,845 ft.

Ouachita County: Burnett Production Co. A-1 Talbert, C NW SE SE 5-15s-19w. Dry. TD 3,809 ft. East Outpost to Curry field.

Union County: Atkins & Pannell Drilling Co. 1 Reynolds-Gammill Lumber Co., C SW SE NE 12-16s-15w. Dry. TD 3,647 ft.

J. L. Foster 2 Irby, C NW NE SE 22-18s-17w. IPF 30 BOPD, Cotton Valley 5,924-29 ft., 43°, 8/64-in. TD 6,052 ft. (New pay in Schuler field.)

OKLAHOMA

Bryan County: W. E. Allaun and Alma McCutcheon 1 Pierce, SW NE SE 35-6s-10e. Dry. TD 2,073 ft.

Garvin County: Geo. E. Cameron, Jr. 1 Mantooth, SE SE NE 34-4n-1w. Dry. TD 4,335 ft.

Kay County: Killingsworth & Taylor 1 Bacher, NW SW NW 24-27n-3e. Dry. TD 3,420 ft.

Nowata County: F. R. Long, Inc. 13-1 Gibson, NW SW NE 13-26n-14e. IPF 20 BOPD, Bartlesville 1,178-84 ft., 36°. TD 1,184 ft. (Oil discovery.)

F. R. Long 24-1 Stockton, NE NE SW 24-26n-14e. IPP 18 BOPD, Bartlesville 1,057-64 ft., 36°, TD 1,064 ft. (Oil discovery.)

Payne County: Texas Pacific Coal & Oil Co. 1 Wetzel "A," NW NE SW 14-20n-2e. Dry. TD 4,874 ft.

Pottawatomie County: T. T. Eason & Co. 1 Whittet, C NE NW 9-11n-2e. Dry. TD 5,623 ft.

Rogers County: S. Hickey 1 Logsdon, SW SE SE 15-24n-15e. IPP ½ BOPD, Mississippi lime 1,093-1,102 ft. TD 1,304 ft. (Oil discovery.)

KANSAS

Barber County: R. C. Patton 1 Blume, NW NW NW 25-32s-12w. Dry. TD 4,867 ft.

Cowley County: Martin & Cash 1 Putnam, SE SW SE 35-34s-3e. IPP 25 BOPD, Hoover 1,981-87 ft. TD 1,987 ft. (Oil discovery.)

Ellis County: Isern Drilling Co. 1 Windholtz, SW SW NW 8-12s-16w. Dry. TD 3,480 ft.

Graham County: Barnett Oil Co. 1 Brandt, SW SE NW 21-8s-21w. Dry. TD 3,713 ft.

Greenwood County: Edwards Oil Co. 1 Edwards, NW NE NE 2-24s-10e. Dry. TD 2,355 ft.

Harper County: Pickrell 1 Campbell, NE NE NE 36-31s-9w. IPF 2,575 BOPD, Mississippian 4,368-88 ft. TD 4,500 ft. (Opens Grabs South pool.)

McPherson County: Trans-Era 1 Meyer, SE SE SE 8-18s-5w. Dry. TD 3,969 ft.

Norton County: Jones, Shelburne & Farmer 1 Brunk, NW NW NW 22-3s-25w. Dry. TD 3,822 ft.

Rush County: Lion Oil Co. 1 Snyder, NW NW SE 25-18s-20w. Dry. TD 4,131 ft.

Seward County: M. B. Armer 1 Warden, C NW 25-34s-33w. Dry. TD 6,146 ft. Geol. test in Hugoton field.

NEBRASKA

Buffalo County: Don H. Peaker 1 Marcus, NE NE SW 7-9n-15w. Dry. TD 3,270 ft. in Lansing.

Don H. Peaker 1 Ebse, NW NW NE 5-8n-18w. Dry. TD 3,888 ft. in Arbuckle.

Cheyenne County: Derby Oil Co. 1 Wilson, SE SE NE 13-12n-52w. Shut-in gas well. TD 5,244 ft. "J" sand discovery, new field.

Ohio Oil Co. 1-B Jurgens, SE NE SW 6-15n-48w. Dry. TD 4,595 ft.

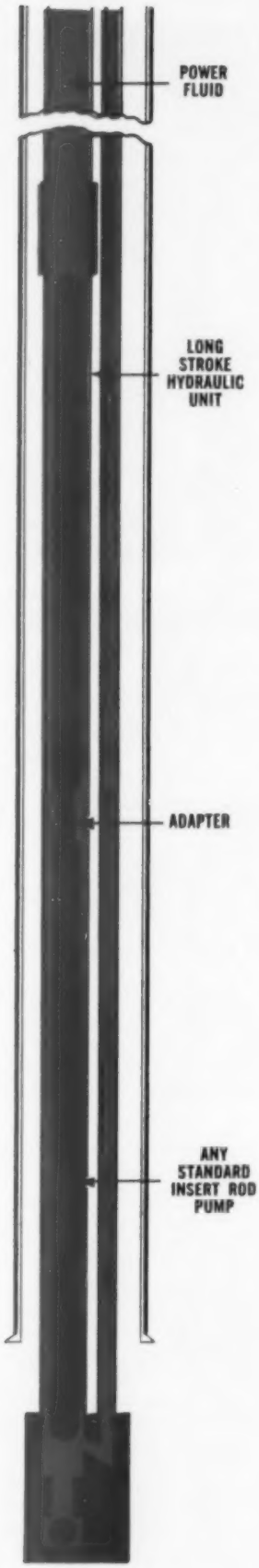
SOUTH DAKOTA

Perkins County: W. H. Hunt-Zach Brooks 1 Federal, NW NE 8-22n-11e. Dry. TD 9,431 ft. in Winnipeg sand.

NORTH DAKOTA

Benson County: Shell Oil Co. 1 Stenson, NW NE 23-156n-69w. Dry. TD 2,495 ft. in Lodgepole.

Golden Valley County, Trotters area: Gulf Oil Corp.-Northern Pacific 1 Federal, NW NE 3-143n-103w. Dry. TD 9,328 ft. in B last salt.



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—U.S. SUPREME COURT

Sargent

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lift more oil — at lower cost!

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There's no guess work when you install Viking pumps for moving viscous or semi-viscous liquids. The priming and discharge action is positive and smooth flowing.

The Viking "gear within a gear" action and port design allows the material to readily enter the pump. The non-slip action of the gears forces the liquid out in steady volume.

Investigate today, the smooth even flow of Vikings handling either viscous or thin liquids. To start, ask for Bulletin 54ST.

See Our Catalog in SWEETS

VIKING PUMP COMPANY
CEDAR FALLS, IOWA

WILDCAT COMPLETIONS

Renville County: Calvert Exploration-Leonard Ward 1 State "A," SW SW 36-164n-87w. Dry. TD 5,415 ft.

CALIFORNIA

Fresno County: F. M. Taylor, Oper. 63 16F, 16-20s-16. Dry. Leda 8,230 ft., TD 9,916 ft.

Kern County: E. A. Bender 56-24 K.C.L., 24-30s-25e. Dry. TD 8,215 ft.

Kenmac Oil Co. 27X-20 Bates Estate, NW SW 20-25s-19e, IPP 50 BOPD, 26° gravity, perfs. 1,450-1,560 ft. TD 1,560 ft. (New pool discovery in Alfertiz Anticline area.)

M J M & M Oil Co. 18-20 Union-Wilson, 20-30s-29e. Dry. TD 8,330 ft.

R. S. Rheem, Oper. 1 Bishop-Movius, 4-28s-27e. Dry. TD 2,600 ft.

Kings County: Franco Western Oil Corp. 53 Norris Baylis, 29-24s-18e. Dry. TD 5,201 ft.

Orange County: Eddie Fisher 11-12 Exeter-Newland, 12-6s-11w. Dry. TD 5,620 ft.

Tide Water Associated Oil Co. 2 Bryant Ranch, 27-3s-8w. Dry. TD 6,285 ft.

Sacramento County: Brazis Oil & Gas Co. 1 Tyler-Island Farms Unit, NW SW 33-4n-4e, IP 2,000 M.c.f. gas through ¼-in. choke, tub. press. 1,250 psi., perfs. 3,645-3,705 ft. in Nortonville sand stringer, TD 3,820 ft. (Approx. ½-mile extension to River Island field.)

Tulare County: Vincent Albano 1 Wiley, 29-22s-27e. Dry. TD 829 ft.

Lloyd Harnish, Oper. 72 Well, 27-23s-23e, first Mya sand 2,720 ft. Dry. TD 2,846 ft.

Ventura County: General Petroleum Corp. 1 Cosby-State, 24-4n-19w. Dry. TD 12,150 ft.

Yolo County: Signal Oil & Gas Co. 4 Signal-Reclamation, 20-12n-1e. Dry. TD 4,700 ft.

MONTANA

Carbon County: Atlantic Refining Co. 1 Probestal, NW NE NW 25-9s-24e. Dry. TD 5,395 ft. in Tensleep.

Golden Valley County: Heep Oil Co. 1 Reed, C SE SE 23-9n-19e. Dry. TD 4,415 ft. in Charles.

Hill County: DeKalb Agricultural-No. Oil Div. 2 Meland, C NW NW 22-35n-13e. Dry. TD 4,182 ft. in Madison.

Richland County, Brorson area: Sun Oil Co.-Phillips Petroleum Co. 2 Dynneson, C SW SW 29-24n-58e. IPP 188 BOPD, Madison discovery, new pay in Brorson field. TD 9,744 ft. in B. Charles salt.

WYOMING

Big Horn County: Seaboard Oil Co. of Delaware 1 Government, NW SW SW 32-51n-91w. Dry. TD 3,655 ft. in Tensleep.

Carbon County, Saratoga Unit: Aurora Gasoline and Kingwood Oil Co. 1 Unit, NE SW NE 31-17n-85w. Dry. TD 1,685 ft. in Tensleep.

Converse County, South Glenrock: True & Brown and R. H. Fulton 32-1, C NW NW 32-33n-76w. Dry. TD 5,886 ft.

Crook County, Grasshopper Butte: M. D. Miller 1 Robinson, SW NW SE 25-50n-67w. Temp. abd. TD 1,140 ft.

Niobrara County: Nebraska Drillers 1 Ward, C SW NE 5-38n-65w. Dry. TD 7,800 ft. in Dakota.

Niobrara County: George Anderson 1 Government, C NE NE 11-40n-65w. Dry. TD 6,970 ft. in Dakota.

Natrona County, Bullseye Unit: Continental Oil Co. 1 Unit, C SE SW 32-35n-82w. Dry. TD 4,470 ft. in Tensleep.

(Continued on page 224)

PERSONALS

Search Goes On

Baker proved geology was a good oil diviner

RAYMOND FRANK BAKER is a top executive of The Texas Co. and occupied with all the varied duties that go with such a post, but he's never stopped looking for oil.

It's always been that way with Baker. He's a prospector, and for 38 years he has operated on the basic principle that geology is the most reliable tool for finding oil fields for Texaco. Today, it's a theory that is respected within his company almost as much as Baker is himself, but it was not always so.

At 24, Baker took to the field in Oklahoma during an era of the oil industry when geologists were just "college-trained punks" to producing men and he wasn't any more welcome than any of the others. Short on words and long on judgment, Baker kept his silence until he knew he had the answers. He and his fellow geologists went right on studying outcroppings and rock configurations.

His Yankee shrewdness is credited with much of the strength which The Texas Co. now exhibits in its domestic production, and he helped put his company in the second-place position in both domestic crude production and reserves. As the company's chief geologist, Baker built a staff of geologists and geophysicists that is one of the finest in the industry. He and his staff made the recommendations which eventually gave Texaco many important oil fields.

In 1933 when Baker became assistant to the vice president in charge of the domestic producing department, Texaco had little more than 100,000 bbl. daily production. Two decades later, it was four times that.

He became general manager of domestic producing in 1947 and in 1949 was elected vice president in charge of domestic producing. He was elected a director in 1950 and 2 years later became executive vice president.

Today, his role is to help form top-level policies that affect exploration and production in his company's worldwide operations. He also serves as a director of several Texaco subsidiaries and affiliates that handle everything from licensing of patents to manufacturing. Characteristically a New Englander, Baker exhibits a calm and even temperament as he carries on his heavy and varied duties taking "everything in his stride" and making his opinions known with a Connecticut Yankee's economy of words.

He doesn't get into the field often these days, but when he does Baker still has the enthusiasm of a youngster on his first exploration. As an associate expresses it: "Wherever he goes, Ray Baker looks for oil."

Walter H. Davidson has been elected vice president of Transcontinental Gas Pipe Line Corp. Davidson has been serving as superintendent of operations for Transco since 1950.

Earl Bruno has been appointed district engineer for Ada Oil Co. in Midland, Tex. Bruno, formerly a division engineer for Western Natural Gas Co., has worked in the Permian and San Juan basins for the past 3 years.

John T. Johnson has joined Lion Oil Co. as a geologist in the Casper, Wyo., district office. Before Johnson served as a geologist with Cities Service Oil Co. in Tyler, Tex.

Jack Colle, consultant, has been elected president of the Houston Geological Society for the fiscal year of 1954-55. Other officers elected are: **Hillord Hinson,** consultant, first vice president; **Ben A. Elmdahl,** Core Laboratories, Inc., second vice president; **Walter W. McMahan, Jr.,** Magnolia Petroleum Co., secretary, and **Judd H. Oualline,** Skelly Oil Co., treasurer. **Thomas D. Barber,** Stanolind Oil & Gas Co., **W. A. Clark, Jr.,** independent, and **Roy A. Payne,** Gulf Oil Corp., were elected to the group's advisory committee.

Frank O. Prior, Jr., has joined **Cortlandt S. Dietler,** Denver independent, as petroleum engineer. Before joining Dietler, Prior was associated with **John W. Mecom,** Houston.

W. A. McFadden, division geologist at Amarillo for Standard Oil Co. of Texas, has resigned to become a consulting geologist and geophysicist at Dallas.

E. E. Fickinger has been promoted to geophysical supervisor by Continental Oil Co. Fickinger, a member of Continental's exploration department at Midland, Tex., will continue to make his headquarters there. Fickinger joined Conoco in 1947 and has served in the midwestern and southwestern states before transferring to Midland in 1953.

Leslie L. Luttes has been named senior geophysicist for the Canadian division of Southern Production Co., Inc., with offices in Calgary. Luttes joined Southern in May after having served in Canada in all phases of exploratory geophysics since 1952.

Bill Evelyn, formerly manager of production for Buckhorn Producing Co., has opened consulting engineering offices in Casper, Wyo.

Lucian F. Harris has been promoted to corrosion engineer with Pan American Pipe Line Co. at Houston. Before his advancement, Harris was serving with Pan Am as a mechanical engineer at Longview, Tex.

Albert S. Baptie has been transferred to Los Angeles as a special assistant to the administration by Shell Oil Co. Baptie had been serving as manager of exploitation at Shell's New York office before his move.

Bruce MacDonald, Hudson's Bay Oil & Gas, Ltd., has been elected president of Central Canada Oil Scouts Association. MacDonald will serve a 6-month term from July 1 to December 31. Other officers elected at the group's recent meeting are: **Fred Morris,** Imperial Oil, Ltd., past president; **Louis A. Sylvestre,** British American Oil Co., Ltd., vice president; **Clifford A. Fiesel,** Canadian Devonian Petroleums, Ltd.,

PERSONALS

secretary; **John K. Sellers,** Tide Water Associated Oil Co., treasurer, and **Leo Prom,** Imperial Oil, editor.

T. A. Ring, former assistant general foreman of the catalytic cracking department at Standard Oil Co.'s (Ind.) Whiting, Ind., refinery, has been promoted to operating foreman at the company's new refinery at Mandan, N. D.

Harold F. Parsons, assistant vice president and manager of the New York crude and products section for Tide Water Associated Oil Co., retired June 30 after 36 years' service with company.

Herbert H. Kelly, director of purchases for Richfield Oil Corp. since 1937, retired June 30. Kelly has served with Richfield and one of its predecessor companies, Rio Grande Oil Co., for nearly 30 years.

L. R. Goldsmith has been promoted to manager of manufacturing by Shell Oil Co. succeeding **A. H. Calderwood,** who leaves on an assignment abroad before retiring at the end of the year. **J. E. Marsland** will succeed Goldsmith as manager of the technological department.

David Proctor has been elected executive vice president of Gulf Oil Corp. Proctor, a director, vice president, and general counsel for Gulf since 1945, is a member of the company's top policy making committees, including the executive, finance, and management policy. Proctor will continue as a director and general counsel for Gulf and many of its subsidiaries.

J. C. McDuffie, Jr., senior petroleum engineer at Humble Oil & Refining Co.'s Houston office, has been transferred to Thompsons, Tex., as district petroleum engineer. Other Humble changes include: **W. M. Parker** promoted from civil engineer at the Southwest Texas division office to district civil engineer at Greta, Tex.; **W. B. Swan,** senior petroleum engineer in the East Texas division office, transferred to Houston as senior petroleum engineer. **W. B. Schultz,** senior petroleum engineer at Houston, moved to East Texas division as senior petroleum engineer.

William F. Knode has been appointed general manager of Alberta Gas Trunk Line Co., Ltd.

Leo B. Agers, formerly district engineer in the natural-gas department of Magnolia Petroleum Co. at Morgan City, La., has been transferred to Dallas as assistant superintendent of joint ownership interests.

John A. Hollinshead, formerly with Coates Drilling Co. in Midland, Tex., has joined Hunt Oil Co. as district engineer and assistant superintendent at Houma, La.

Morris R. Morrow has been promoted to research specialist in the research and development division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. Morrow joined Humble after receiving his masters degree in chemical engineering at the University of Texas in 1940.

E. Ralph Rowzee, vice president and manager of Polymer Corp., Ltd., of Sarnia, Ont., has been elected president of Chemical Institute of Canada for 1954-1955. Among the Fellows of the Institute elected at the annual meeting in mid-June was **L. C. Lajoie,** technical superintendent of Imperial Oil, Ltd., of Montreal.

Lewis R. Rogers, Superior Oil Co., has been elected chairman of the conservation committee of California oil producers. Rogers has served on the conservation committee for 10 years. Other officers elected are: **F. T. Lloyd,** Richfield Oil Corp., first vice chairman; **Sol Alexander,** Century Oil Co., second vice chairman, and **J. W. LePrince,** General Petroleum Corp., secretary.

Frank T. Gray has been promoted from petroleum engineer assistant to senior petroleum engineer assistant at Brownfield, Tex., by Magnolia Petroleum Corp. Other changes by Magnolia include: **Theophilus Griffith** from junior petroleum engineer to petroleum engineer at Morgan City, La.; **Frank H. Baker** from petroleum engineer assistant to senior petroleum engineer assistant at Salem, Ill.; **Julian C. Herring** from junior petroleum engineer at Salem, Ill., to petroleum engineer; **Doyle Gene Marrs** from junior petroleum engineer to petroleum engineer at Drumright, Okla.; **Walter A. Shulaw** from junior petroleum engineer to petroleum engineer at Falfurrias, Tex.; **Archie M. Speir** from junior petroleum engineer to petroleum engineer at Lake Charles, La.

E. B. Granville, petroleum engineer with British American Oil Co., has been transferred from the company's Denver offices to Dallas.

G. M. Cook has been appointed assistant to the president of Oronite Chemical Co. Cook had been serving as senior research chemist for California Research Corp., which conducts research for Oronite.

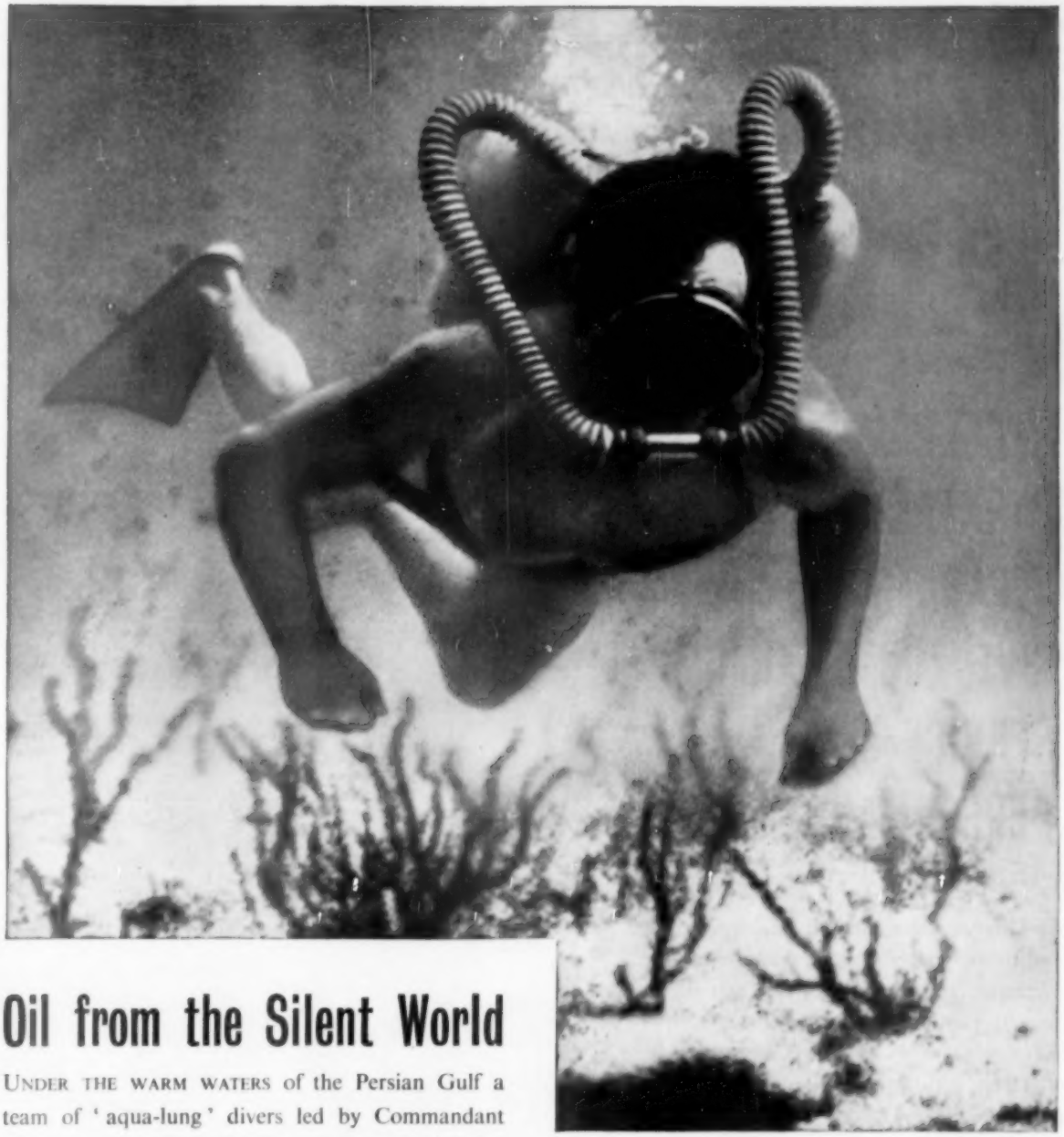
Howard Mays has been named superintendent of Pure Oil Co.'s natural-gasoline plant at Van, Tex. He replaces **John N. Prater,** who has retired after 23 years as superintendent of the plant.

W. N. Finnegan, executive assistant at Humble Oil & Refining Co., announced his retirement July 1. A veteran of 30 years in the oil industry, Finnegan had served for many years as chairman of the public relations committee for Humble.

C. F. Stephenson has been promoted to Oklahoma division production superintendent of Magnolia Petroleum Co. Stephenson, who had been serving as assistant division superintendent of Oklahoma, succeeds **A. H. Proctor,** who retired after 40 years' service.

George B. Kitchel has been named vice president in charge of Gulf Coast operations for Kerr-McGee Oil Industries, Inc., with offices in Houston. Before his promotion, Kitchel was manager of the drilling department.

Kerr-McGee has announced the following promotions: **Jean C. Finley,** manager of exploration, made vice president of the division; **James J. Kelly,** formerly manager of refinery operations, advanced to vice president in charge of sales; **A. T. F. Seale,** manager of natural gasoline and general engineering, made vice president in charge of this department; **J. W. Roach,** former superintendent of refining operations, named manager of operations in the manufacturing department, and



Oil from the Silent World

UNDER THE WARM WATERS of the Persian Gulf a team of 'aqua-lung' divers led by Commandant Cousteau—famous underwater explorer—is helping Anglo-Iranian's search for oil.

These men, swimming like fish over the seabed, can explore its geology more closely than has ever before been possible.

Soon, oil from under the sea may be added to the 400,000 barrels per day which flow through Anglo-Iranian's refineries in seven countries. Meanwhile the search for more oil continues from Papua to Nigeria as Anglo-Iranian products spread heat, light and power across the world.

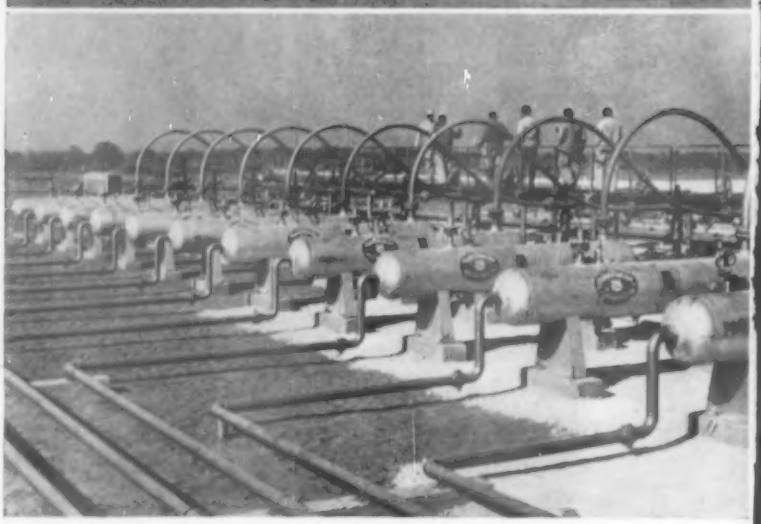
THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company
LIMITED

Whether it's Vertical or Horizontal...

PARKERSBURG SEPARATORS GIVE YOU MAXIMUM SERVICE and PERFORMANCE

Whatever your oil and gas separating conditions, you can select a Parkersburg Separator, fully confident that it will do the job required. Parkersburg's know-how, experience and engineering skill . . . the unlimited range of separator types and sizes . . . the availability of special units is practical assurance that you don't have to compromise service and performance even under the most unusual conditions.



5421

THE PARKERSBURG RIG & REEL COMPANY • PARKERSBURG, WEST VIRGINIA

Division of Parkersburg-Aetna Corporation

PRESSURE EQUIPMENT

SEPARATORS • HYRECO • DEHYDRATORS • KNOCKOUTS • SCRUBBERS • TREATERS • HEATERS

PERSONALS

W. H. Dean, former general drilling superintendent, advanced to manager of the drilling department.

Garth Nielson has been appointed field engineer for Canada Southern Oil Co. at Kindersley, Sask.

Paul W. Rogers, chief engineer for Ohio Fuel Gas Co., has been elected an assistant vice president of the company. Rogers, who joined Ohio 21 years ago, had served as chief engineer since June 8, 1953.

Woody W. Fisher, vice president of Petroleum, Inc., has been named manager of the company's new Colorado office where the company has extensive operations in the Julesburg basin. **O. G. Frakes** has been appointed Kansas area landman for Petroleum, Inc.

J. P. Bailey has been appointed to the newly established position of senior geologist (special projects) for the southern district of Standard Oil Co. of California's exploration department. **E. C. H. Lammer,** former district supervisor at Salt Lake City, will succeed Bailey as southern district geological supervisor. **S. J. Kriz** will take over Lammers' position as district supervisor in Salt Lake City.

W. O. Ham, Jr., regional geologist for Continental Oil Co., has just been promoted to assistant general manager of the southwestern region at Fort Worth. He succeeds **H. S. Skinner,** recently transferred to Houston as administrative assistant to the president. Ham was promoted to regional geologist for Continental's southwestern region in 1952. He has worked in the company's geological department for 11 years at Ponca City, Okla., Abilene, Midland, and Fort Worth.

M. C. Jones, former assistant general superintendent, Tulsa, has been placed in charge of crude-oil traffic for Mid-Continent Pipe Line Co. Jones joined Mid-Continent in 1930 as a laborer at Weleetka, Okla. **O. E. Bryant,** former district superintendent at Wewoka, Okla., has been promoted to assistant general superintendent in charge of operations with headquarters in Tulsa. **R. L. Cowan,** former foreman of gagers will succeed Bryant as district superintendent at Wewoka.

William E. McGuirk, Jr., has been appointed executive vice president of Davison Chemical Co., division of W. R. Grace & Co.

R. G. Arner, manager of Sinclair Refining Co.'s East Chicago, Ind., refinery, has been promoted to the newly created position of assistant to the vice president in charge of manufacturing.

J. B. (Ben) Heid retired from Universal Oil Products Co. July 1 after 38 years in the oil industry. Heid began his career in the oil business in 1917 and served with Cosden & Co. as assistant mechanical superintendent at West Tulsa.

Trimble R. Bruce, geologist with Gulf Oil Corp., has been transferred from Durango, Colo., to Wichita.

Bryan S. Reid, general manager of the Chicago division of Socony-Vacuum Oil Co., Inc., retired July 1 after 43 years service in the oil industry.

C. L. Burrill has been appointed chief economist of Standard Oil Co. (N. J.). Burrill returned to Jersey March 1, after having served as vice president of Creole Petroleum Corp. He has been serving as manager of the general economics department.

DEATHS

John Cannon, 78, retired Gulf Oil Corp. refinery engineer, died June 30 at his home near Milam, Tex.

Sam B. Raitman, 61, died recently in San Mateo, Calif. Raitman was a pioneer operator in the East Texas field and later operated out of Tulsa. His final play was the Williston basin.

Del Fortney, 65, one of Michigan's pioneer wildcatters and oil producers, died June 22 in a Grand Rapids, Mich., hospital. Fortney had been ill for several years with a heart condition.

Thomas E. Waddill, 56, foreman of Lone Star Gas Co.'s Fort Worth pipeline district, died June 27 in a Fort Worth hospital. Waddill had been with Lone Star since 1925.

Lowell Saunders, 53, president of Intex Oil Co., was killed recently in California when his car went out of control and smashed into a truck. Saunders, a geologist, formed Intex in 1935.

Albert J. Scherzer, independent oil operator for 30 years, died June 25 in a Tulsa hospital. Introduced to the oil business in Wichita, Kans., he had resided in Tulsa since 1924.

Sir Stephen Kenneth Guthrie Williamson, 66, 2d Baron Forres of Glenogil, Scotland, died June 26 in London. Lord Forres, an industrialist, businessman, and banker, was chairman of Lobitos Oilfields, Ltd., which produces oil in Peru, and of Anglo Ecuadorian Oilfields, Ltd., producer in Ecuador.

Richard M. Morrison, 56, died June 25 in a New York hospital. Morrison, who joined The Texas Co. in 1928, has served as manager of the purchasing department since 1947.

Thomas P. Lee, 43, died in a Houston hospital June 28 following a lengthy illness. Lee, who was associated with his three brothers in the Lee Brothers Oil Co., was a son of W. E. Lee, pioneer Texas oil man.

Earle A. McGowan, 59, oil lease broker and state Republican leader, died June 25 at Ardmore, Okla. A native of Iowa, McGowan came to Oklahoma before statehood and entered the oil business in 1923.

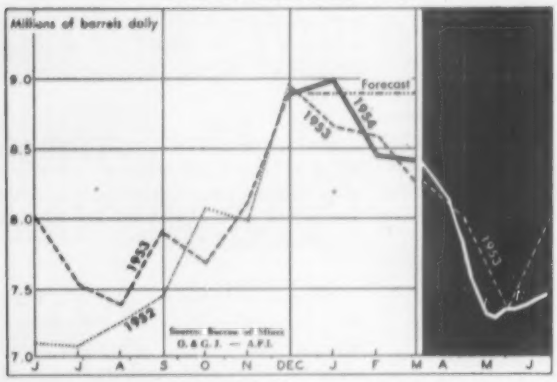
Redford Bond, 76, chairman of Oklahoma's state Corporation Commission, died June 24 in an Oklahoma City hospital. Bond, who would have completed 20 years as chairman of the commission in July, had been in ill health for several months. Bond was appointed to the Corporation Commission in 1934 by Oklahoma Governor William H. (Alfalfa Bill) Murray and was elected to the office in 1936, 1942, and 1948 by large majorities. At the time of his death, Bond was a candidate for renomination in the July 6 Democratic primary.

Latest Figures . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,460,050	DOWN	400	DOWN	143,350
Crude stocks	277,673,000	UP	1,488,000	DOWN	870,000
Completions	986	DOWN	1	UP	68
Refinery runs	6,939,000	UP	46,000	DOWN	108,000
Gasoline stocks	168,034,000	DOWN	862,000	UP	22,383,000
Four-product stocks	328,346,000	UP	4,334,000	UP	30,009,000
Total imports	933,500	DOWN	40,500	DOWN	128,500

TOTAL DEMAND—ALL OILS



Gasoline Sales Pushed, But No Cut Reported in Motor Fuel Production

SALES departments of some of the important suppliers of the country have been pushing so hard to move a large volume of gasoline by July 4 that most major markets are feeling the pressure.

Almost all suppliers have agreed that gasoline stocks are too high and that gasoline production should be reduced enough to cut inventories down to near last year's level.

Demand at the end of May was a gage point. Movement out of primary terminals was good, but not as good as some marketers had expected earlier in the year. Total gasoline demand for June will fall well under the average of 3,838,000 bbl. daily for June 1953.

The second check point . . . Following the demand sampling at the end of May, suppliers take the next closer-than-normal look at market trends just before July 4. This holiday period, particularly if it comes on a week end, has heavy traffic and high gasoline consumption.

In addition to being a test period for peak summer demand for gasoline, the holiday week end serves as a check on movement for the season to date.

If increased activity by sales departments is an indication of decisions by suppliers, some have at last taken a look at inventories and decided that too much gasoline may be left over at the end of the season.

Pressure on markets . . . In many instances the extra push to unload some gasoline by July 4 has tended to soften the market for this product. In most cases, the original sales efforts did not take the form of direct reductions in price. The pressure on the market was a secondary reaction. This reaction has taken two widely different forms.

If the primary sales effort by a supplier resulted in spot sales to a new customer, the supplier who lost the customer had to find a new account to stay even. In some cases, price reductions were used to make up the volume loss.

Also, softening markets influence buying programs of secondary suppliers and jobbers. If there is a chance that prices may be down next week, the jobber will tend to keep his stocks at a low level in order to take advantage of the expected decrease in price.

Continued high production . . . Refinery operations for the week of June 26, reported by A.P.I., indicate that suppliers are attempting to solve the problem by increasing sales without reducing gasoline production.

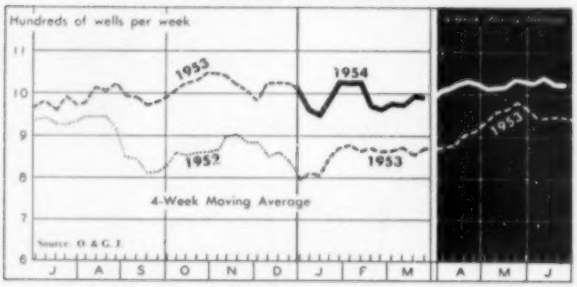
For the week ended June 26, refiners made gasoline at the rate of 3,409,000 bbl. daily from crude runs that averaged 6,939,000 bbl. daily. Both runs and refinery production represented increases over the previous week.

Gasoline stocks decreased only 862,000 bbl. for the week, compared with a reduction of 2,493,000 bbl. for the same week last year. Gasoline stocks are now 22,383,000 bbl. greater than a year ago.

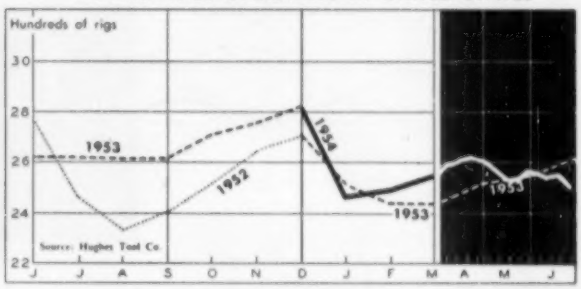
No progress has been made toward solving the problem of excess gasoline inventories. Since the first of May gasoline stocks have been cut only 9,024,000 bbl. compared with a reduction of 10,740,000 bbl. in the same weeks last year.

The picture at the second check point is not too good.

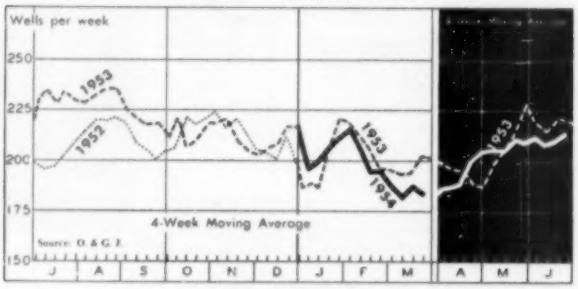
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

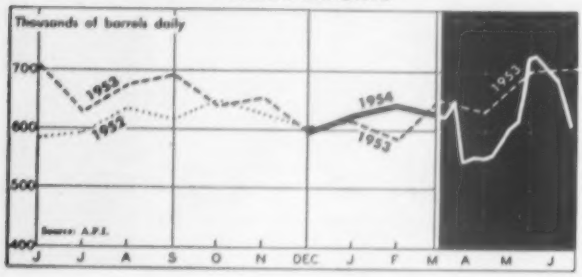
Area—	6-28-54	Change from 6-21-54	Change from 6-29-53
Gulf Coast	531	—24	— 70
N. and W. Texas-New Mexico	795	—21	— 25
Arkansas-N. Louisiana-E. Texas	172		30
Oklahoma	311	1	— 26
Kansas-S. Nebraska	176	11	17
Illinois-Eastern	139	— 8	— 9
Rocky Mountain	240	—20	— 24
Pacific Coast	136	— 1	— 35
Total United States	2,500	—62	—142
Western Canada	115	9	— 68

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 26, 1954

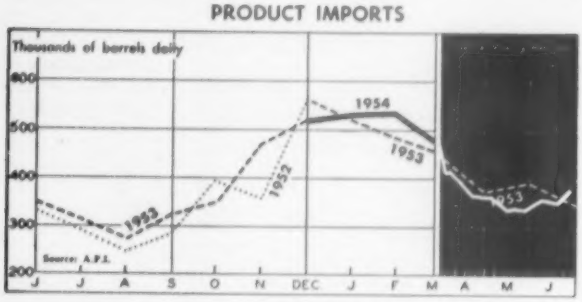
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	8,496	53	66	0	0	0	2	2	2	0	2	43	47
Arkansas	14	4	0	10	49,216	307	219	1	0	0	4	5	15	0	4	50	69
California	52	36	1	15	255,607	1,208	1,264	1	0	1	11	13	37	1	7	261	306
Colorado	23	8	4	11	126,082	630	270	2	0	2	7	11	20	0	8	236	264
Illinois	45	32	0	13	112,136	1,333	848	0	0	0	1	1	5	0	0	201	206
Indiana	19	9	1	9	27,110	381	580	0	0	0	0	0	5	0	0	79	84
Kansas	87	52	6	29	286,174	2,160	2,408	2	0	0	8	10	38	0	9	281	328
Kentucky	19	7	3	9	34,378	545	500	0	0	0	0	0	10	0	1	55	66
Louisiana	62	39	12	11	386,842	1,635	1,247	1	1	0	2	4	51	32	15	141	239
North	33	20	8	5	90,307	896	509	0	0	0	2	2	5	3	6	58	72
South	29	19	4	6	296,535	739	738	1	1	0	0	2	46	29	9	83	167
Michigan	11	4	0	*7	33,098	270	260	0	0	0	5	5	8	0	0	111	119
Mississippi	9	3	0	6	67,137	191	180	0	0	0	3	3	4	0	0	69	73
Montana	5	2	0	3	29,480	139	183	1	0	0	3	4	2	0	1	38	41
Nebraska	7	3	1	3	34,098	173	155	0	0	1	3	4	11	0	3	54	68
New Mexico	11	4	5	2	80,236	501	668	1	0	0	2	3	10	0	6	60	76
North Dakota	10	7	0	3	75,960	123	126	0	0	0	3	3	3	0	0	42	45
Ohio	29	10	7	†12	65,453	561	494	0	0	0	0	0	3	0	4	9	16
Oklahoma	89	60	1	‡28	256,296	4,491	3,517	3	0	0	5	8	61	2	14	297	374
Pennsylvania-New York	44	13	12	§19	75,249	1,181	1,143	0	0	0	0	0	0	0	5	19	24
Texas	411	225	48	138	2,032,398	8,889	8,429	23	3	11	93	130	377	41	82	2,029	2,529
Southwest (1 & 4)	44	20	8	16	209,814	1,257	1,381	3	0	5	11	19	64	20	24	346	454
Gulf Coast (2 & 3)	65	36	4	25	437,673	1,325	1,238	2	3	1	16	22	38	16	22	322	398
East (5 & 6)	23	9	4	10	115,580	461	408	0	0	1	8	9	8	0	7	134	149
North Central (7-B & 9)	137	73	10	54	458,960	3,317	3,137	12	0	4	34	50	155	4	12	832	1,003
West (7-C & 8)	117	84	1	32	749,398	2,057	1,860	6	0	0	23	29	111	0	12	352	475
Panhandle (10)	25	3	21	1	60,973	472	405	0	0	0	1	1	1	1	5	43	50
Utah	4	0	0	4	11,754	32	35	0	0	0	3	3	2	0	1	17	20
West Virginia	13	1	10	2	32,185	260	279	0	0	1	0	1	0	0	14	7	21
Wyoming	19	11	0	8	96,435	669	316	0	0	0	4	4	25	0	3	93	121
Miscellaneous (S. D.)	1	0	0	1	9,431	80	28	0	0	0	1	1	2	0	0	13	15
Total United States	**986**	530	111	345	4,185,251	25,812	23,215	35	4	16	160	**215**	691	76	179	4,205	5,151
Total previous week	987	528	73	386	3,931,685			25	6	11	199	241	656	72	163	4,045	4,936
Total June 27, 1953	918	437	71	410	3,708,848			22	5	9	194	230	690	52	184	4,318	5,244

Service wells included: *1, †3, ‡5, §16.

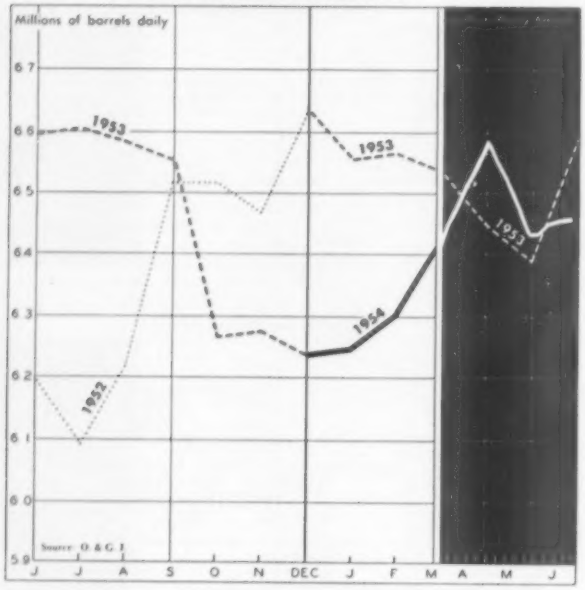
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



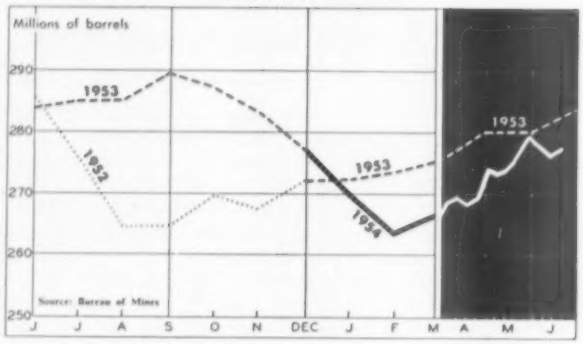
DAILY AVERAGE PRODUCTION FOR WEEK

	June 26			June 19
	Crude oil	Lease condensate	Total	total
Alabama	4,400		4,400	4,500
Arkansas	77,450	550	78,000	77,500
California	988,900		988,900	989,500
Colorado	124,700		124,700	128,000
Eastern	55,000		55,000	55,000
Florida	1,650		1,650	1,650
Illinois	191,400		191,400	187,100
Indiana	29,800		29,800	28,400
Kansas	333,300		333,300	329,200
Kentucky	37,500		37,500	37,600
Louisiana	666,950	43,700	710,650	710,500
North	108,950	3,700	112,650	112,500
South	558,000	40,000	598,000	598,000
Michigan	34,100		34,100	34,600
Mississippi	89,250	3,250	92,500	92,950
Montana	38,100		38,100	37,400
Nebraska	18,900		18,900	18,800
New Mexico	205,200	1,750	206,950	207,050
Oklahoma	480,000		480,000	†484,500
Texas	2,725,500	50,000	2,775,500	2,775,500
Dist. 1	43,700	400	44,100	44,100
Dist. 2	143,500	7,100	150,600	150,600
Dist. 3	434,800	24,250	459,050	459,050
Dist. 4	248,000	5,850	253,850	253,850
Dist. 5	45,700	450	46,150	46,150
Dist. 6	114,000	5,200	119,200	119,200
East Texas field	236,000		236,000	236,000
Dist. 7-B	119,300	25	119,325	119,325
Dist. 7-C	185,600	4,600	190,200	190,200
Dist. 8	881,900	1,700	883,600	883,600
Dist. 9	193,000	400	193,400	193,400
Dist. 10	80,000	25	80,025	80,025
Utah	5,100		5,100	5,400
Wyoming	238,900		238,900	240,400
North Dakota	14,700		14,700	14,900
Total U. S.	6,360,800	99,250	**6,460,050**	†6,460,450
Change from previous week, down			**400**	
Canada	289,375		289,375	289,375

Total U. S. production January 1-June 26 †1,138,349,300 bbl.
Same period last year (crude plus cond.) *1,152,589,812 bbl.

*Includes 16,407,750 bbl. condensate. †Revised.

CRUDE-OIL STOCKS



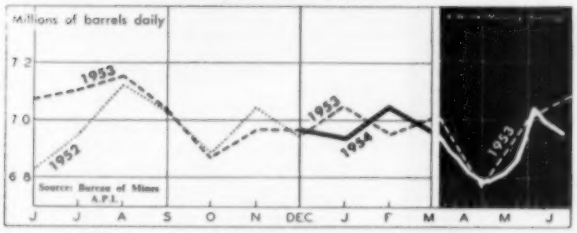
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

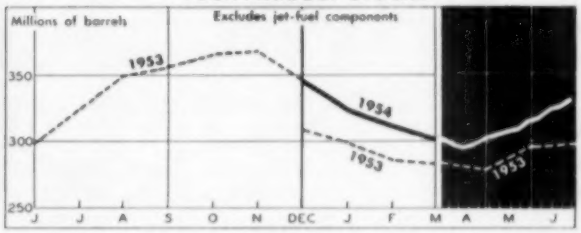
	June 19, '54	June 12, '54	June 20, '53
Pennsylvania Grade	3,283	3,190	2,648
Other Appalachian	1,842	1,925	2,410
Illinois, Indiana, Michigan	12,666	12,891	11,918
Kansas	9,685	9,878	9,190
Oklahoma	27,218	27,059	29,847
Arkansas	3,395	3,381	2,698
Louisiana	16,113	16,163	15,740
North	2,384	2,520	2,574
Gulf	13,729	13,643	13,166
Mississippi	3,123	3,211	3,762
New Mexico	7,170	7,203	7,293
Texas	130,366	128,206	131,247
East Texas proper	12,056	12,294	10,891
West Texas	55,559	54,424	61,894
Texas Gulf	29,383	28,660	25,977
Other Texas	33,368	32,828	32,485
Wyoming	13,110	13,289	14,103
Other Rocky Mountain	4,740	4,282	3,478
California	32,459	32,881	32,861
Foreign	†12,503	12,626	11,348
Total	277,673	276,185	278,543

*Bureau of Mines. †Includes 2,530,000 bbl. in California.

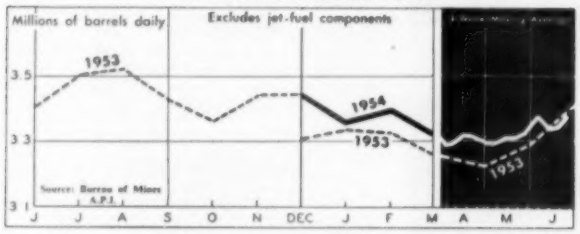
REFINERY RUNS



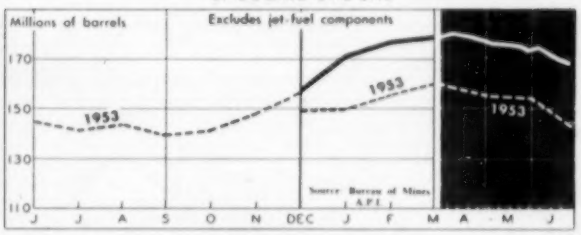
FOUR-PRODUCT STOCKS



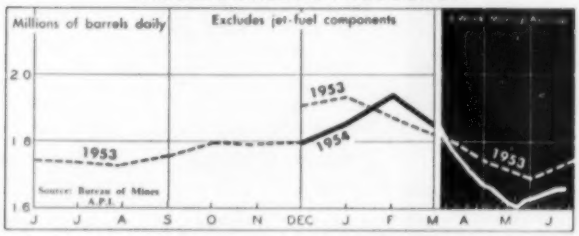
GASOLINE PRODUCTION



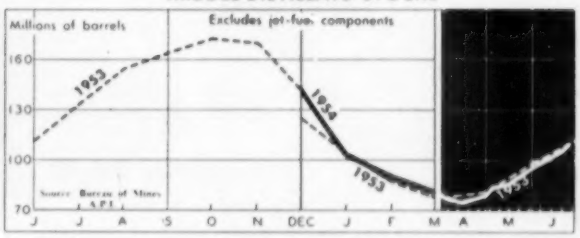
GASOLINE STOCKS



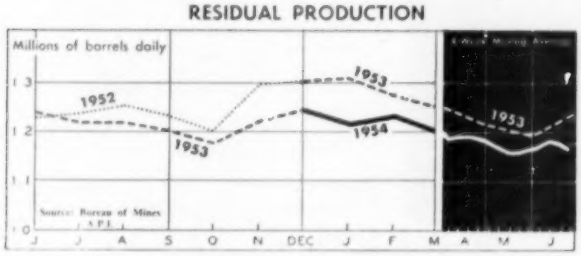
MIDDLE-DISTILLATE PRODUCTION



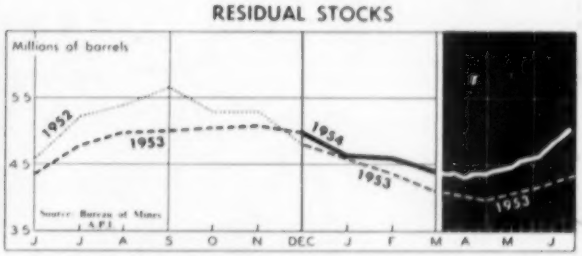
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JUNE 25

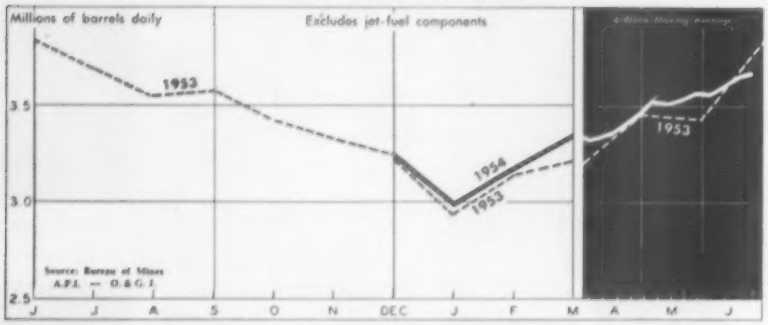
(Excludes all jet-fuel components)

(Thousands of barrels)

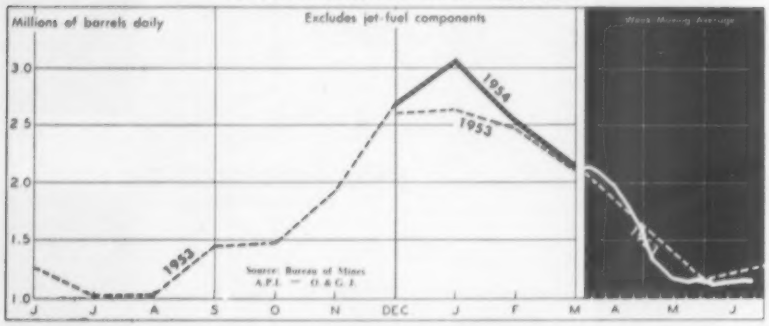
District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1953: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,033	415.9	27.4	224.9	188.7	37,642	11,124	27,062	10,334	1,077	419.4	37.2	256.9	240.5
Appalachian:														
District 1	107	47.7	2.7	24.2	12.3	4,320	439	1,477	491	108	45.3	4.8	18.1	13.8
District 2	90	54.3	2.0	13.4	10.2	2,751	401	662	339	90	45.1	5.2	11.3	12.1
Ind., Ill., Ky.	1,256	665.4	63.3	234.6	169.7	37,270	5,937	15,784	4,609	1,252	668.8	70.6	211.3	162.8
Okla., Kans., Mo.	621	358.3	16.3	137.7	45.4	17,146	1,567	9,306	1,365	630	353.0	18.3	146.6	45.4
Inland Texas	254	177.6	11.4	42.1	24.9	6,534	395	1,542	1,263	258	169.4	9.5	44.0	33.3
Texas Gulf Coast	1,650	814.7	93.9	361.6	225.7	20,820	3,197	9,010	4,516	1,710	811.4	104.2	393.0	255.3
La. Gulf Coast	599	277.6	68.0	138.1	49.4	8,821	2,461	3,778	1,258	579	290.3	40.3	144.9	57.2
N. La. and Ark.	87	37.7	7.1	18.7	5.4	3,587	715	970	141	87	31.2	7.2	21.7	7.1
Rocky Mountain:														
New Mexico	19	12.0	1.0	3.0	2.9	232		71	30	20	12.6	0.4	3.0	4.1
Other Rocky Mtn.	248	124.4	1.6	59.7	44.0	8,148	240	2,160	887	239	113.1	2.5	52.1	42.0
California	975	423.3	4.6	127.7	346.3	20,763	461	11,191	25,129	1,031	450.2	6.5	137.5	364.8
June 25, 1954	6,939	3,408.9	299.3	1,385.7	1,124.9	168,034	26,937	83,013	50,362	7,081	3,409.8	306.7	1,440.4	1,238.4
June 18, 1954	6,893	3,369.6	312.3	1,327.4	1,152.9	§168,896	25,942	§79,402	§49,772					
June 27, 1953	7,047	3,453.1	332.0	1,453.0	1,262.0	145,651	26,453	82,634	43,599					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Revised.

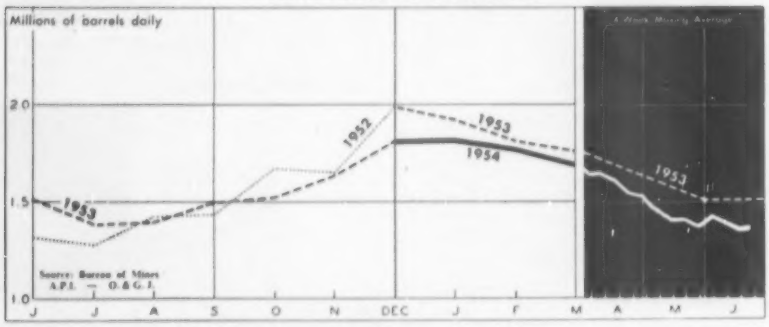
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of June 30, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.625-11	11.5-12.25	10-10.25
Premium gasoline	11.75-12	13.25-14	11.25-12
42-44 w.w. kerosine	9-9.25	9.70-9.95	8.75-9
No. 2 straw fuel oil	8.125-8.25	8.70-8.95	7.75-8
No. 6 residual	$1.00-1.10	$2.15-2.30	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis. No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Most suppliers on the East Coast have met the voluntary allowance of 0.25 cent a gallon on kerosine and distillate fuel. In some cases the reduction is quoted as an allowance, and in others it is shown as a reduced posting.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 6-25-54	3,377	3,673
April 1954	3,298	3,547
March 1954	3,261	3,331
June 1953	3,410	3,838
Middle distillate:		
Four weeks ended 6-25-54	1,663	1,145
April 1954	1,696	1,598
March 1954	1,811	2,240
June 1953	1,747	1,280
Residual fuel:		
Four weeks ended 6-25-54	1,162	1,366
April 1954	1,141	1,486
March 1954	1,169	1,667
June 1953	1,238	1,506

SUPPLY AND DEMAND*

(Thousands of barrels daily)

	April 1954	April 1953
Domestic demand	**7,450**	**7,512**
Gasoline	3,462	3,338
Kerosine	230	256
Distillate	1,276	1,272
Residual	1,413	1,573
Jet fuel	103	94
Lubricants	111	121
L.P.G.	299	335
Other products	529	505
Crude loss	27	18
Exports	**384**	**506**
Gasoline	85	135
Kerosine	22	31
Distillate	70	104
Residual	73	79
Jet fuel	2	1
Lubricants	51	33
L.P.G.	12	8
Other products	22	20
Crude	47	95
Total demand	**7,834**	**8,018**
Gasoline	3,547	3,473
Kerosine	252	287
Distillate	1,346	1,376
Residual	1,486	1,652
Jet fuel	105	95
Lubricants	162	154
L.P.G.	311	343
Other products	551	525
Crude exp. and loss	74	113
Stock change	**392**	**85**
Crude	281	161
Products	111	—76
New supply	**8,226**	**8,103**
Imports	**949**	**1,004**
Crude	574	628
Products	375	376
Production	**7,277**	**7,099**
Crude	6,615	6,446
Natural gasoline, etc.	662	653
Runs to stills	**6,811**	**6,781**

*Bureau of Mines.

(The schedule of selected crude prices appeared on page 202 of June 28 issue and will be printed again next week.)

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WILSON GIANT—Serial No. 6383. Sales Price—$6,000. Equipped with Two Waukesha 145 GK Engines in good condition. General Appearance—Fair. Rig used for Work-Over. Price includes Kelco Spinning and Foster Breakout Catheads; Stromberg - McCreary Air Starters on Engines. Brakes circulating water-cooled; Manual Friction Clutches in Transmission; Others — Jaw Clutches. Rig has Slush Pump Drive and Rotary Drive. Location of Unit—Lake Charles, Louisiana. Contact Cardwell, Houston.

FOR SALE. New S-33 Walker-Neer Spudder. Drilled one 1600' well. All tools from 12½" down through 4", trucks, trailer, new lines, long bits and bailers. This is a complete outfit ready to rig up and drill. Morrison Drilling Co., Box 7146, Tulsa. Office phone 7-0559. Home 7-5767. Denny Morrison.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

RESERVOIR ANALYSIS EQUIPMENT

Wofford Type Sampler
Field Transfer Bottles
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ENGINEERING PRODUCTS INC.
(Successors to Engineering Laboratories, Inc. BHP Division)
600 E. 4th St. Phone 2-7223
Tulsa 3, Oklahoma

PIPE

126,672 feet 8⅝" O.D. 28.55 pounds per foot.
36,325 feet 12¾" O.D. 49.56 pounds per foot.

The above reconditioned steel pipe is machine cleaned, straight, beveled for welding in 20 foot random lengths.

NEW ELECTRIC WELD PIPE

Outside Diameter	Wall Thickness	Quantity In Feet
8⅝"	.352"	1000
9⅝"	.385"	4200
16"	.375"	4800
20"	.281"	2400
24"	.406"	1600
26"	.312"	4200
30"	.375"	1200

This is structural grade pipe in 40 foot lengths.

All pipe is suitable for gas, water and oil, as well as for culverts, piling and structural purposes.

FOR SPECIAL QUANTITY PRICES WRITE, WIRE OR PHONE

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-163)
Kansas City 18, Kansas
ATwater 9305

FOR SALE EQUIPMENT

ONE MAYHEW 600 Drill and 800-gallon water truck both mounted on 1953 F-600 V-8 Fords. 200 ft. new drill pipe and all hand tools. All equipment in excellent condition. Buford Miller, Box 100, Phone 1222-W, Guthrie, Oklahoma.

TWO MODEL K Cardwell Spudders, fully equipped, excellent condition, operating in tri-state area. For further information write Box H-263, The Oil and Gas Journal, Tulsa, Oklahoma.

10,000 ft. 6" OD 12# seam. x 16/22 ft. No. 1 @ 55c ft. 10,000 ft. 4" 11# T & C line No. 2 @ 52c ft. 1500 ft. 20" OD 5/16" No. 1 x 16/22 ft. @ 2.25 ft. Moritz Company, Braddock, Pa.

NEW REED TOOL JOINTS—½ PRICE
279 pairs (box & pin) 3½" API full hole super shrink grip tool joints, 4⅝" o.d., 2 7/16" bore, 18" length per pair. 317 pairs (box & pin) 3½" API full hole conventional type, 4⅝" o.d., 2 7/16 bore, 18" length per pair. Arrow Tool & Supply Ltd., Box 4392, South Edmonton, Alberta, Canada.

FOR SALE
8" LINE PIPE

250,000'—8⅝" O.D. 28.55#
Lapweld

All used #1 grade, machine cleaned, straight, 20' single random lengths, ends beveled. Suitable installation, oil, water, or gas pipeline systems 850 to 900# PSI. Large additional quantities same size in process, taking up and reconditioning. Priced attractively, prompt shipment, Carrollton, Mo.

Write, Wire, Phone

HUMBOLDT-CHICAGO PIPELINE PROJECT
125 W. 3rd St. Tulsa, Okla.
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FOR SALE EQUIPMENT

FOR SALE: Model "K" Cardwell tubing and rod unit complete with tubing and rod tools, mast, mounted on Ford tandem truck. Melco Drilling Company, Seminole, Oklahoma.

FRANKS ETS-500—Single Drum Hoist Less Engine. Sales Price—$1,500. General Appearance — Good. Unit complete with Franks Power Take-Off; Mounted on Steel and Wood Truck Bed. Location of Unit—Winfield, Kansas. Contact Cardwell, Wichita.

FRANKS MODEL 5000 Spudder — Serial No. 866. Sales Price—$7,500. Equipped with one Cummins HB1-600 Engine in good condition. Brake Rims in fair condition; Brake blocks—Good. General appearance—Good. Chains—Good. Basic Machine equipped with Spudding attachment, Skid and 45° Double Leg Pipe Mast with 8⅝" and 7" Pipe Legs; 4-Sheave Crown of Wilson Manufacture. Price includes Mast Guy Lines. Location of Unit — Western Kansas. Contact Cardwell, Wichita.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.
H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

SISAL Rope
OVER 1,000,000 FEET
¾" AND OTHER SIZES
WIRE ROPE, CABLE SLINGS
BLOCKS, SHACKLES
RIGGING EQUIPMENT
FANTASTIC SAVINGS!
Write — Wire — Phone for Inventory & Quantity Prices!
DULIEN STEEL PRODUCTS, Inc. of Calif.
11611 S. Alameda, Los Angeles 2, Calif. LOrain 6-2106

FOR SALE
INGERSOLL-RAND
GAS ENGINE DRIVEN COMPRESSORS

1—	XVG-8	—350 H.P.
1—	XVG-6	—250 H.P.
1—	XVG-4	—150 H.P.

ANY COMBINATION COMPRESSOR CYLINDERS.
SPECIFY INLET AND DISCHARGE PRESSURES.
PROMPT DELIVERIES.

EARL E. KNOX COMPANY
TELEPHONE: 2-5204
BACON STREET, ERIE, PA.

FOR SALE EQUIPMENT

BRAND NEW 6x4x6 Worthington Duplex Steam Pumps, $410.00 each, FOB Houston. Subject to Prior Sale. Halloran Equipment Co., 5702 Harvey Wilson Drive, Houston 20, Texas.

WILSON GIANT, San Juan Basin, with 2-V12 Le Roi, 131' L. C. Moore, Sub-structure, Blowout Preventer, 7¼ x 14 Pump, 5000' 4½" D.P., 10 Drill Collars, complete ready to run. P. O. Box 1826, Wichita Falls, Texas.

ONE PORTABLE RIG, capable of 1000 foot with 4½ inch drill pipe. Powered with D318 Caterpillar, 2400 hours actual. Approximately 800 foot 4½ inch drill pipe. 41 foot hydraulic lift derrick. Tandem truck with winch. IHC water truck. C. H. W. Drilling Co., Elkhart, Kansas.

TWO 80,000 BARREL STORAGE TANKS

120' x 40' Heavy Gauge
Excellent Condition
Suitable for Petrochemicals

MERCHANTS STEEL & SUPPLY CO.
105 S. LaSalle St.
Chicago 3, Ill.
Phone: Fr. 2-5312

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE
8" SURFACE CASING

10,000'—8⅝" O.D.

28.55# Lapweld

20' single random lengths, 8 V threads and couplings, used good condition. Priced attractively, Prompt Shipment, Grandview, Mo.

Write, Wire, Phone

Humboldt-Chicago
PIPELINE PROJECT

125 W. 3rd St., Tulsa, Oklahoma
Phones 2-9128—54-4229

FOR SALE EQUIPMENT

4—10,000 bbl. bolted steel tanks, 55' dia. x 24' ht. 1—1550 Gaso pump, size 5 x 10. 2—1550 Gaso pumps, size 2½—5 x 10. 3—Caterpillar diesel power units, No. D 4600. Clark Oil & Refining Corp., P. O. Box 297, Blue Island, Illinois. Tel. WAterfall 8-5200. Attn.:—H. Beck.

FOR SALE: 5700 ft. 4½ Used Drill Pipe. Excellent condition for shallow drilling. Located east of Norman. Randall R. Morton Drilling Co. Tulsa, Oklahoma, 5-6609.

CLARK MODEL MA-8, 300 BHP, 600 RPM, Midget Angle Type, Skid Mounted, Gas Engine Driven Compressor, equipped with eight-8¼" Bore x 8¼" Stroke, power cylinders. Double acting C.I. compressor cylinders as follows, Two-11" first stage, One-7¾" second stage, and One-4½" third stage. 814.4 p.s.i.a. max. discharge at 945,000 C.F.D./ 14.7# —60° F.—Zero Suction. Maximum WP, first stage 350 p.s.i., second stage 500 p.s.i., third stage 900 p.s.i. Unit is mounted on Tandem axle lowbed semi-trailer, mobile operation from trailer. Previous use, pipeline testing with approx. 3800 hours logged, 2 years old. For further details contact Algonquin Gas Transmission Company, 25 Faneuil Hall Square, Boston 9, Massachusetts.

SHOT HOLE CASING—Approx. 6,000' of new 3" O.D. x 10' long 16 gauge threaded shot hole casing. 22 cents per foot f.o.b. Tulsa, Oklahoma. Don R. Hinderliter, Inc., P. O. Box 1864, Tulsa 1, Oklahoma.

WILSON TITAN, San Juan Basin, 2-LRO Waukesha, 131' Emsco Mast, 10' Sub-structure, 7¾ x 16 Pump, 6000' 4½" D.P., 10 Drill Collars, Blowout Preventer, see on job. P. O. Box 1826, Wichita Falls, Texas.

WILSON SUPER, San Juan Basin, 87' Mast Pole, Substructure, 3000' 4½" D.P., 6 Drill Collars, 7¼ x 12 Pump, complete rig. P. O. Box 1826, Wichita Falls, Texas.

FOR SALE: 1 Mayhew 2000 heavy duty drill with auxiliary motor and 5 x 8 pump mounted on tandem drive Ford truck. In A-1 condition. Lewis & Clemens Drilling Co., Box 101, Princeton, Indiana, Telephone 1460.

FOR SALE: 6000' 4" O.D. seamless line 32' random lengths 40c; and 4000' 5½" seamless line, random lengths 24' 65c. Neither size has been used. Good as new. M. J. Regan Pipe Co., Coffeyville, Kan.

PRODUCTION EQUIPMENT in use only three months—D-13 National Pumping Unit —15 H.P. Electric Motor. 2500' 5½"—17# Casing. 4000' 2½"—6.4# Tubing. 3800' ¾" Sucker Rods. 7½' x 19' Burt Emulsion Treater. 3—Hi-500 Bbl. Bolted Steel Tanks. Fluid Packed 2½" Tubing Pump. 333—94' Production Derrick. Miscellaneous Equipment for complete well hook-up. Location —Gilbertown, Alabama. Contact Walter Hamilton, P. O. Box 215, Pensacola, Florida.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

75,000 ft. 6⅝" O.D. 18.97# P.E. Line Pipe now taking up in Kansas. 7,000 ft. 7" O.D. 26# L.W., 10 thd., Byers W.I. Casing. 3,800 ft. 8⅝" O.D. 32# L.W., 10 thd., Byers W.I. Casing. 3,750 ft. 2⅞" O.D. EUE SS, Rge. 1, 10 thd. Tubing. All strictly A-1.

GLICKMAN IRON & SUPPLY COMPANY
Box 3108 Wichita, Kansas
Phone AMherst 2-6418

Ton and one-half Chevrolet truck, low mileage. Special built aluminum body, 3000 watt fully automatic light plant, 180 gallon water tank, automatic water pump.

Royal Spartanette trailer like brand new. Stop anywhere, hook hose from truck to trailer and plug in lights for city convenience.

Light plant runs off main gasoline tank, has fuel pump. Fill water tank any filling station. Two Butane gas tanks for cooking. Water heated by Electric plant.

Out of this world for out of the way living or for Sportsman, Hunter or Fisherman.

Norvell-Wilder Supply Company,
P. O. Box 2178, Houston, Texas
Telephone ATwood-3471.

FOR SALE EQUIPMENT

FOR SALE—Late Model 36-L Bucyrus-Erie complete with casing strut, auxiliary leg, necessary casing tools. Steel dog house with 6 lockers, Kohler light plant, tool float, 5", 6" and 8" tools complete, 70 bbl. swab tank, 5" and 6" Burt and Guiberson swabs, 1950 ¾ ton Chevrolet Pickup. All in first class shape. Call or write A. F. Johnston or D. W. Palmitier, Box 1820, Pampa, Texas, phone 4-6981.

WILSON ATLAS. Sales Price—$21,000.00. Equipped with two L1-600 Cummins Diesel Engines in good condition: includes pump drive, 12 PD groove sheave and V-belts. One American cathead and one plain spool cathead. Compound enclosed oil-bath. Includes one 1000 gal. fuel tank. Contact Cardwell, Houston.

70,000' NEW BLACK PIPE, 1½", 2⅜", 1½" 2" G.V. & GLOBE. R. E. Kershaw, Surplus, 306 S. 4th, Muskogee, Oklahoma.

FOR SALE: 20,000' 2" seamless line pipe. 20' or 40' random lengths. Clean inside and out. Will stand any pressure requirements. Good as new. 20c. M. J. Regan Pipe Co., Coffeyville, Kan.

FOR SALE: 5% Discount off Mill Shipment price, 289 Jts. 3½" 13.30# Grade "E" Internal Flush New Drill Pipe, has Hughes hard face Tool Joints installed. Pipe at Hughes Tool Co., Houston. Arrow Supply Co. 6-3552, Box 2649, Odessa, Texas.

FOR SALE: 10% Discount, 1 New 3½" BJ "MAA" DP Elevator, 1—4½" ditto, 1—4½" "AA" ditto. Arrow Supply Co. 6-3552, Box 2649, Odessa, Texas.

WATER FLOOD PUMPS, 2¾ x 6 and 3¼ x 7 High Pressure Salt Water Pumps. For further information contact: The Wichita Pipe & Supply Co. P. O. Box 1803. Phone 3-8197, Wichita Falls, Texas.

WELL DRILLING EQUIPMENT. New and used spudders, rotaries, core drills. Tools, pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colo.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WILL TRADE Steam Drilling Rig complete, less drill pipe, capable of drilling to 11,000 feet for Steel Deck Barge 175' long by 44' wide by 11' deep. Bateman Drilling Company, 601 The Texas Company Bldg., New Orleans 16, Louisiana.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

MATERIAL WANTED

One 13⅝" Shaffer Blowout Preventer, Type 39. One 10¾" Shaffer Blowout Preventer, Type 39.

MAKIN DRILLING COMPANY
P.O. Box 1628
Hobbs, New Mexico

HELP WANTED

GEOPHYSICIST for review interpretation and supervision of seismic work for integrated oil company at permanent location. Please summarize educational and experience background in first letter. Salary commensurate with experience. Box H-245, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, Production and Water Flood experience to take complete charge of field operations. Illinois Basin. Give age, experience and salary expected. All replies confidential. Our employees know of this ad. Box H-252, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

EXCELLENT opportunity with a Midwest Engineering Company for young engineer with B.S. in Chemical Engineering or equivalent. Would participate in new tray design and development with opportunity to enter sales. General experience in fractionation and absorption design desirable. Box H-225, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION GENERAL MANAGER —Wanted an experienced Construction executive to assume full responsibility for management of a well established building business serving the oil, chemical, power, steel and related industry. This applicant must be qualified to direct sales, engineering and heavy construction work. Reply giving personal history, education, experience and salary range. Box H-264, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM OR RESERVOIR ENGINEER

With minimum 3 years experience in development, production and oil and gas reservoir engineering on primary and secondary recovery problems. For New York office of major foreign producer.

MICROPALEONTOLOGIST

Preferably with an advanced degree and a minimum of 5 years' commercial or academic experience. To work in New York research laboratory. This position demands broad interests in Stratigraphy and Biofacies and the capacity to do independent work on projects assigned.

Salary for above positions dependent on experience and qualifications. Write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OGJ-11
Arabian American Oil Company
505 Park Avenue
New York 22, N. Y.

HELP WANTED

CHEMICAL ENGINEER
Petroleum manufacturing, northwest location, regular entering position, company benefit plans, with or without petroleum refining experience, college transcript and a detailed work record required. Box H-266, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

PETROLEUM ENGINEER
(Production, Reservoir)

Positions open in Arabia. Require suitable educational background and 3 to 5 years experience. One year contract. No family quarters. Excellent salary and benefits. Apply in writing, furnishing full description of experience and qualifications to:

AMERICAN INDEPENDENT OIL CO.
111 Sutter St., San Francisco

DESIGN & DEVELOPMENT ENGINEER

Finned tube industrial heat exchange equipment as used in oil-refineries and industrial processing. BSME, recent experience in the field, minimum 3 years experience. Ability to co-ordinate and develop design and production from inception to final test.

TEST ENGINEER

Minimum of 2 years lab test experience on industrial heat exchange equipment. BSME.

Plant is located in Southern California.

Box H-269, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGISTS

Major company beginning exploration program in Egypt is accepting applications for the following geological positions:

Research Geologist—regional and local stratigraphic studies; knowledge of micropaleontology; 4 or more years of experience, preferably including foreign.

Photogeologist — experienced in geological interpretation of air photos.

Surface Geologists (3) — 2 or more years of experience in surface mapping.

Junior Geologists (3)—for surface mapping; little or no experience necessary.

Seismograph Geologists (2)—some experience in subsurface and geophysical operations.

Reply, stating qualifications and experence, to:

Box H-216
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

DUE TO EXPANSION program large independent oil company has openings for assistants in seismic recording and computing. College graduates with at least one year of experience in geophysics desired. Ample opportunity for advancement. Give educational and previous employment details in initial letter and include photograph. All replies confidential. Box H-265, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED, Manufacturers representative with good following among independent and major producers and pipe line companies, to represent the new Carbro Fuel Generator which minimizes fuel costs on pumping wells and pipe line stations. Liberal commissions. Open territories. Please give details of present lines and sales area coverage. Box 487, Wichita, Kansas.

REFINERY ENGINEERS
needed in
SOUTH AMERICA

Attractive staff positions are available with affiliates of Standard Oil Company (N. J.) for qualified experienced technical graduates.

MECHANICAL ENGINEERS — must be thoroughly qualified and experienced design of refinery or chemical plant equipment including piping, pressure vessels, heat exchangers.

CHEMICAL ENGINEERS—assignments in process engineering will include economic studies and preparation of refinery operating programs.

Write giving age, education, marital status, and details of previous experience.

Box 308-U
Radio City Station
New York 19, N. Y.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

WANTED PARTNER

Graduate Petroleum Engineer or Geologist familiar with shallow production, cable tools and rotary. Independent producer offers exceptional opportunity to purchase ½ interest in well established oil business for inventory prices, in rigs, pipe, production etc. Ideal situation for young aggressive man to join older geologist in money making shallow area. State education and experience. Amount required at inventory prices for ½ interest $225,000.00. No information by mail. Will arrange personal interview at Chicago, Illinois. Box H-268, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL MAINTENANCE FOREMEN FOR AMMONIA PLANT

A ground floor opportunity with an anhydrous ammonia and nitrogen solutions plant, now being constructed in Central Illinois by nationally known company which is rapidly expanding in the chemical field. Experience in ammonia or high pressure plant preferred. To supervise maintenance shop and field work on compressors and allied process equipment. Kindly submit resume of experience and qualifications. Include telephone number.

Box H-267, The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

OFFICE MANAGER - WAREHOUSEMAN with 8 years' experience in office management, warehousing, and some sales work with major manufacturer. Will relocate for right position. Presently employed. Contact Box H-248, The Oil and Gas Journal, Tulsa Oklahoma.

PETROLEUM ENGINEER—4½ years experience in production and waterflood operations with major oil company in mid-continent area. Desire employment with independent, preferably Oklahoma. Box H-261, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLER. Experience, 17 years in production and drilling. Any department. Age 37. Absolutely sober. George Markin, 3301 North McKinley, Oklahoma City 18, Oklahoma. Phone Jackson 8-5464.

SITUATIONS WANTED

YOUNG MAN . . . Excellent educational background, 4 years petroleum analyst Wall St. Willing to learn anything with oil company in Los Angeles. Box H-257, The Oil and Gas Journal.

CHEMIST, M.S., 5½ years experience operating Sulfur, Girbotol, Gasoline Plants. Laboratory organization. Desires relocation. Box H-262, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 34, married, 7 years varied experience in Gulf Coast, Rocky Mountains, and Permian Basin with large Independent. Desires to re-establish in Louisiana Gulf Coast with aggressive Independent. Box H-270, The Oil and Gas Journal, Tulsa, Oklahoma.

FIELD SUPERINTENDENT: 37, Married, B.S. degree. In charge of drilling, production, maintenance of our family-owned properties in Penn Grade region past 9 years. Commercial pilot of light planes since 1942. Box H-241, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 35, married, Master's degree, present managerial position: experienced oil and uranium exploration, leasing, engineering, deals and farmouts. Desires position with aggressive independent or individuals in Rocky Mountain region. Box H-259, The Oil and Gas Journal, Tulsa, Oklahoma.

SUPERVISING Pipeline Accountant. Seven years experience with crude-products pipeline operators. Can organize, manage, and handle all administrative detail. Familiar with all Federal accounting requirements. Box H-259, The Oil and Gas Journal, Tulsa, Okla.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico,
Phone 3-3141.

146 Allen Building, Midland, Texas,
Phone 2-2962.

BUSINESS OPPORTUNITIES

FOR SALE: Well established Pipe Service Co. All equipment in excellent condition. Gross $80,000 1953. Several major company contracts, franchise on part of service, specializing pressure testing, cleaning, threading, etc. Low overhead, best location in Mid-Continent Area. Box H-222, The Oil and Gas Journal, Tulsa, Oklahoma.

PROFESSIONAL SERVICES

CO_2 CONSULTANT

Separation-Purification-Manufacture of Dry Ice from well gases. Design, construction, operation, trouble shooting.

Box H-230
The Oil and Gas Journal
Tulsa, Oklahoma

ROYALTIES

JACK EAGLE, Oil Properties, 706 City Nat'l Bldg., Oklahoma City, Oklahoma. Telephone REgent 6-7027.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

FOR SALE: 6 Blocks—from 320 to 2820 acres—Harding County, New Mexico—$3.00 per acre—all blocks neighboring each other—can be bought as one drilling block—consists of approximately 9200 acres. J. J. Enkich, 2318 No. Greenview, Chicago, Ill.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

WILL pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

FOR SALE AT PUBLIC AUCTION: Mullendore leases, SW¼ & N½ SW¼ SE¼ 3-30-9, Elk County, Kansas. 6 producing, 2 equipped non-producing wells, power house, engine, lease house, tanks and all equipment. To be sold to highest bidder at south front door of court house in Howard, Kansas at 2 o'clock p. m., Tuesday, July 6th. Abstracts furnished. THOS. C. FORBES, Special Master, phone 195, Eureka, Kansas.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and you haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LOOKING TOWARD CANADA FOR BETTER OPPORTUNITIES?

Alberta offers larger blocks, better deals, exciting new producing horizons, new markets. Leases, reservations (20,000 to 100,000 acres), drilling deals and farmouts arranged by one of Alberta's most successful operators.

Box H-205, The Oil and Gas Journal, Tulsa, Oklahoma

IMPORTANT WELL TO DRILL ROCKY MOUNTAIN AREA

Contract calls for drilling by Aug. 15, testing multiple prod.; zones to east. Oil men & investors who appreciate great potential values furnished technical data gratis.

W. J. Peterman, Geologist
Exploration (1918-1954) Engineering
Portales New Mexico

OIL WELL FOR SALE

At Duck Lake, Michigan

R. L. PATTINSON

Aylmer, Ontario

LEASES ROYALTIES

Producing and Nonproducing Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

MONEY RAISING

YOUR FINANCING PROBLEM can most probably be solved. Inquiries invited. Box H-220, The Oil and Gas Journal, Tulsa, Oklahoma.

STRIP LOG CABINETS

MORE LOGS ARE FILED in Kraftbilt Strip Log Cabinets than all others combined! Loaded drawers glide smoothly on roller bearings. Three drawers to section—add sections as needed. Built to last a lifetime! Send for Catalog 352-B. Ross-Martin Co. P. O. Box 800-A, Tulsa 1, Okla.

REAL ESTATE

FOR LEASE AT LIBERAL, KANSAS: 6,000 feet of store and warehouse space. Attractive new building, masonry construction. Loading dock. Located on 3½ acre tract. Will divide. Ideal for an oil field supply company. H. J. Demmin, phone 3362 or write General Delivery, Liberal, Kansas.

HAVEN FROM THE HEAT

LOVELY THREE bedroom, three bath home in restricted residential community of Rancho Santa Fe, California, 25 miles North of San Diego, 5 miles inland from ocean beaches. Unexcelled year round climate, golf and riding. Price $75,000. For particulars write Paul T. Galleher, Realtor, P.O. Box 807, Rancho Santa Fe, California.

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

MODERN OFFICE SPACE FOR LEASE

5,000 Sq. Ft. second floor office space over National Bank of Sweetwater, Sweetwater, Texas. Will remodel and air condition to suit tenant. Parking space nearby. Major oil company production office occupies balance of floor. In center of CAMBRIAN AND REEF development.

CONTACT

NATIONAL BANK OF SWEETWATER
SWEETWATER, TEXAS

WILDCAT COMPLETIONS

(Continued from page 210)

West Poison Spider: Pure Oil Co. 4 Unit, SW SE NW 11-33n-84w. Dry. TD 9,214 ft. in basal Mesaverde.

East Teapot Dome: Sodak Mining Co., Bruce Anderson-R. L. Peterson 1 Government, SW SE NE 2-38n-78w. Dry. TD 2,750 ft. in Shannon.

Sheridan County, Decker area: C. M. & W. Drilling Co. 1 Haywood, C SW NW 34-58n-84w. Dry. TD 4,642 ft.

Weston County, Mush Creek: Earl F. Wakefield 1 Morris, SW NW SW 15-44n-64w. Temp. abd. TD 5,080 ft. in Newcastle.

UTAH

Emery County, Cleveland: Paul B. English 1-B English, SE NW SW 12-17s-9e. Junked hole. TD 2,040 ft.

Hancock-Utah Development Co. 1 Cedar Mountain, C SW SW 9-19s-12e. Dry. TD 4,944 ft. in Miss.

Grand County, Cisco Nose: Utah Southern Oil Co. 2-A Government, C SW NE 20-21s-23e. Dry. TD 1,570 ft.

COLORADO

Adams County: Fallon Gas Co. 2 Sholz, NW NW NE 4-3s-58w. Dry. TD 6,053 ft.

Gem Oil Co. 1 Mitchell, NW NW SW 4-3s-59w. Dry. TD 6,262 ft.

El Paso County: New Seven Falls Co. 1 "A" A. G. Hill, SE SW NW 26-13s-67w. Dry. TD 3,825 ft. in Hygiene.

LaPlata County: Phillips Petroleum Co. 1-8 Ute, NW SE SE 8-34n-8w. Temp. abd. TD 2,842 ft. in Lewis.

Logan County: British-American 1 Ellwood, C SW NE 15-19n-54w. Shut-in gas discovery, "D" sand, new field. TD 5,245 ft.

Shell Oil Co. 1 "A" State, E½ NW SE

32-7n-52w. IPF 249 BOPD, "D" sand oil discovery, new field. TD 4,590 ft.

Morgan County: Aurora Gasoline Corp. and Kingwood Oil Co. 1 Lauck, SW SW NE 25-3n-58w. Shut-in gas well. TD 5,645 ft. in "J" sand.

Lion Oil Co. 1 Raleigh, NE NE NE 26-1n-57w. Dry. TD 5,810 ft.

McMahon & Bullington 1 Peterson, NE NE NE 19-3n-56w. Dry. TD 5,516 ft.

O'Donnell & Edmondson and Sinclair 1 Jacobson, SW SW SW 25-5n-60w. Swabbed 155 BOPD, "J" sand oil discovery, new field. TD 6,351 ft.

Weld County: Lee Armer 1 Warren Livestock Co., C NE NE 5-11n-66w. Dry. TD 11,066 ft. in Lyons.

MANITOBA

Poplar Gas-Admiral 1 Antler, LSD 8, 15-1-29w2. Dry. TD 3,800 ft.

California Standard 15-36 Whitewater, LSD 15, 36-3-22w1. Dry. TD 4,101 ft.

ALBERTA

Scurry Anglo 1 Calvan, LSD 7, 5-17-18w4. Indicated Madison oil well. TD 5,191 ft. PBTD 4,175 ft.

El Centro 12-10 Naco, LSD 12, 10-39-7w4. Dry. TD 2,857 ft.

Gulf 10-27 Little Smoky, LSD 10, 27-67-22w5. D3 oil well. TD 8,804 ft.

Union Northern Development 15-2 Oldman River, LSD 15, 2-12-14w4. Dry. TD 3,068 ft.

Texaco-Reio Prado A7-9 Red Creek, LSD 7, 9-1-16w4. Dry. TD 2,638 ft.

Los Nietos-Socony 12-35 Stonelaw, LSD 12, 35-33-19w4. Dry. TD 6,039 ft.

Baysel 4-26 Namepi Creek, LSD 4, 26-58-21w4. Basal quartz gas well. TD 4,250 ft.

Shell 6 Olds, LSD 6, 31-30-1w5. Dry. TD 9,606 ft.

Western 15-6 Suffield, LSD 6, 15-14-9w4. Dry. TD 3,254 ft.

SASKATCHEWAN

Tide Water 1 Bladworth Crown, LSD 16, 36-27-29w2. Dry. TD 5,750 ft.

Tide Water 1 Staynor Crown, LSD 1, 29-2-22w3. Dry. TD 4,764 ft.

Sohio Canamerican 13B6 Creelman, LSD 13, 6-10-10w2. Dry. TD 5,000 ft.

Socony Woodley Southern 3-5 Hazlet, LSD 5, 3-17-20w3. Dry. TD 4,443 ft.

Tide Water 1 Sultburn Crown, LSD 4, 18-23-16w3. Dry. TD 2,207 ft.

Tide Water 1 Leinan Crown, LSD 9, 20-17-14w3. Dry. TD 3,580 ft.

Tide Water 8-18 Pelletier Crown, LSD 8, 18-12-15w3. Dry. TD 4,233 ft.

Socony Sohio 23-5 Strathallen, LSD 5, 23-2-3w3. Dry. TD 8,538 ft.

Dunn is General Manager, Vertical Turbine Pumps

Fenmore E. Dunn has been chosen as general manager of Worthington Corp.'s reorganized vertical turbine pump division, according to an announcement by Edwin J. Schwanhausser, executive vice president.

A member of Worthington for several years, Dunn's new headquarters will be at Worthington's Succasunna, N. J., works. Dunn's responsibilities will include product and application engineering, as well as the manufacture and sales of the vertical turbine pumps.

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LEGAL

Sealed bids will be received at the Jicarilla Indian Agency Office, Dulce, New Mexico, until 3:00 o'clock, P. M. (MST), July 28, 1954, and then publicly opened for sale of oil and gas leases on 39 tracts of Jicarilla Tribal Indian lands, totaling 62,248 acres, more or less, located in Rio Arriba and Sandoval Counties of New Mexico on the Jicarilla Indian Reservation. Each tract, containing one to four sections each, is offered for lease separately. Complete description of the land, location, provisions, and stipulations of the leases to be sold, may be obtained from the Superintendent, Jicarilla Indian Agency, Bureau of Indian Affairs, Dulce, New Mexico, upon request.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that the SE¼ SE¼ sec. 4, T. 30 N., R. 2 W., Michigan Meridian, containing 40 acres, within the known geologic structure of Headquarters Field, undefined, in Clare County, Michigan, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., on August 11, 1954, when bids will be opened. Details of the lease offering, how and where to submit bids, and bid forms may be obtained from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Chief, Division of Minerals.

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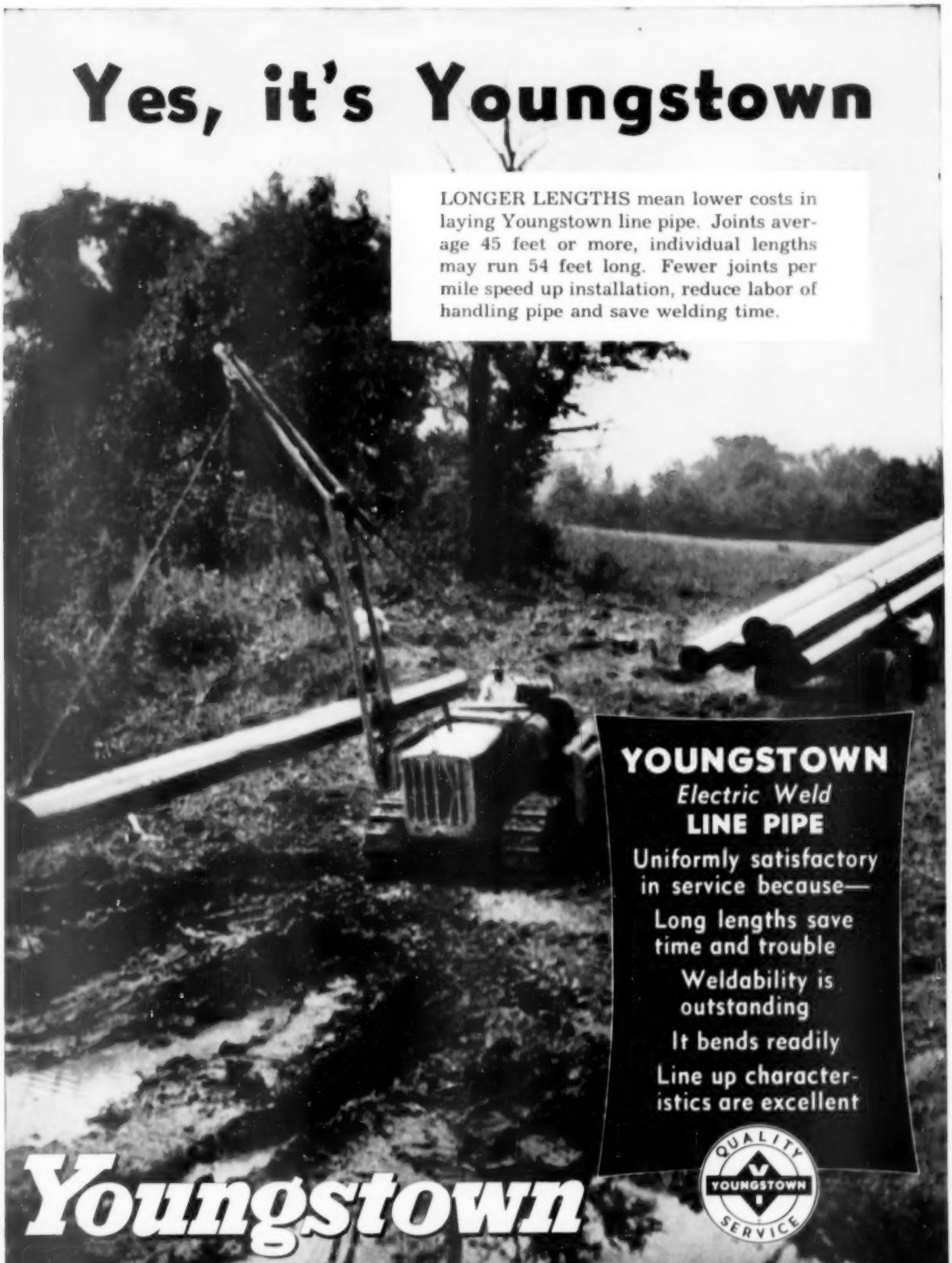

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